MODERN REFRIGERATION AND AIR CONTROL

Vol. 64 No. 762 SEPTEMBER, 1961 Price 2s. 6d. monthly

STANDARD UNIT COOLERS

LOW TEMPERATURE UNIT COOLERS

ELECTRIC DEFROST

WATER DEFROST

Types :

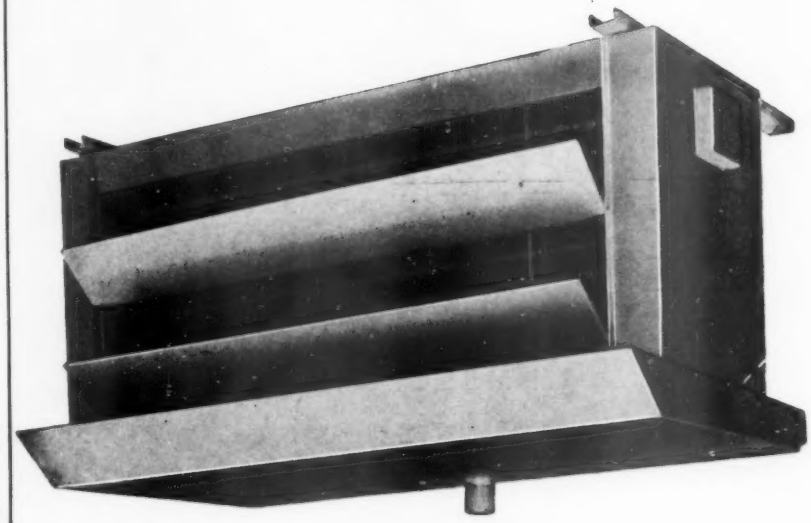
CEILING MOUNTED

WALL MOUNTED

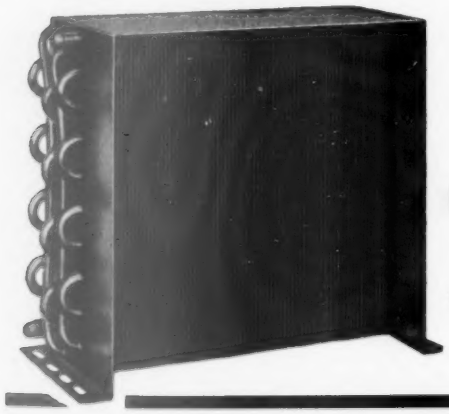
CIRCULAR (ceiling mounted)

REACH IN COOLERS (ceiling mounted)

S.A.E.R.
UNIT COOLERS



CONDENSERS
FOR HERMETIC AND OPEN UNITS



Most Units offered from stock

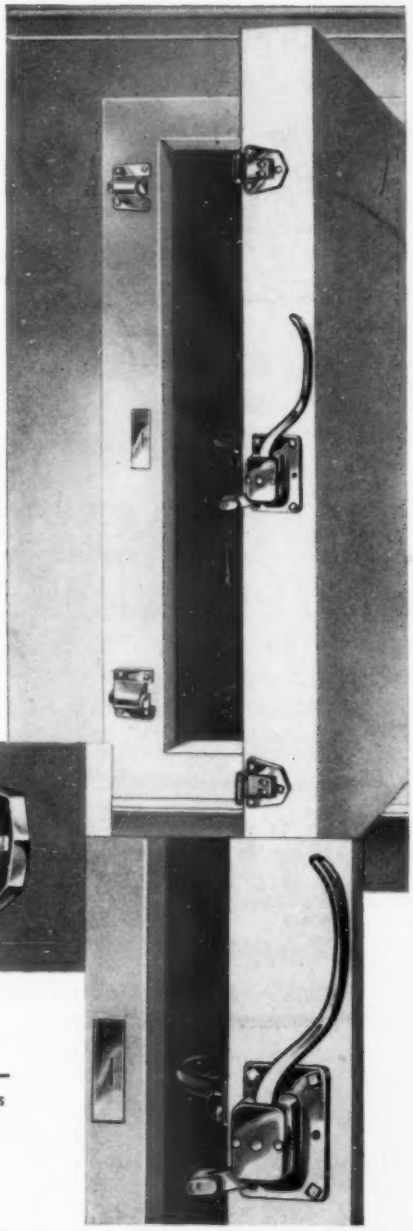
SEND FOR DETAILS TO :

Manufacturing HRP LIMITED Engineers

99 KINGS ROAD, CHELSEA, S.W.3
FLAXMAN 1144 (3 LINES)

The SUPER-CAS DEEP FREEZE FASTENER

PATENT NO. 840,661

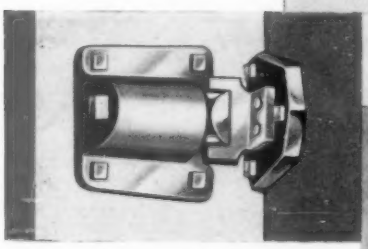


Specialities

- Van door two point Freezer Door Fasteners
- The "Cassey" Throwover Fastener
- Streamline Fastener
- "Walcas" Fastener
- "Rolcas" Fastener
- "Redmac" Fastener
- "J" Type Fastener
- Roller Bolt Fasteners of all types
- "Casko" Ball Bearing Hinges
- "J" Type Hinges
- Strap Hinges of all types

In Galvanised Malleable Iron or Chrome plated finish on Brass

Catalogues on application

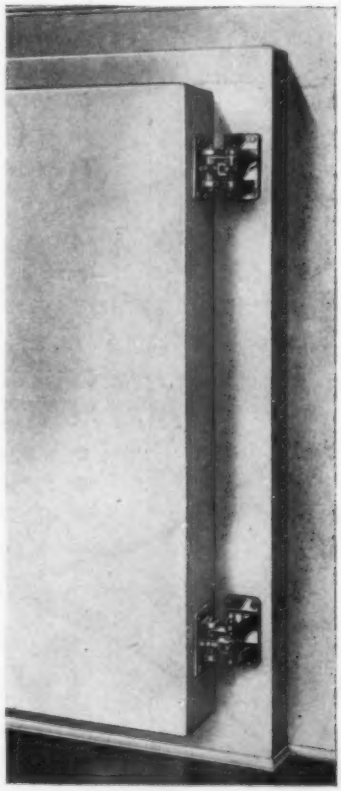


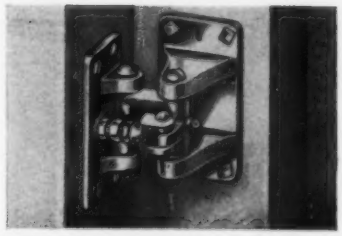
HINGES C.19A/B/C

A	B	C
for Doors from 5½" to 7" thick	for Doors from 7½" to 10" thick	for Doors from 4" thick

and

"CASKO" ADJUSTABLE BALL BEARING DEEP FREEZE HINGE





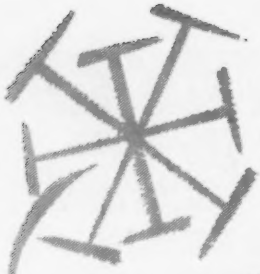
WALCAS

WALTER CASSEY LIMITED

141 PLECK ROAD
WALSALL

TELEPHONE :
WALSALL 25438

TELEGRAMS :
CASKOFRIG · WALSALL



3 *aids to efficient operation of coldrooms...by the coldroom problem specialists!*

Miniveil

AIR CURTAINS FOR OPEN COLDROOM DOORS

- COMPLETELY UNIMPEDED DOORWAYS!
- MAINTAINING TEMPERATURES!
- EASY MOVEMENT OF GOODS!

Minidoors

PART HEIGHT FLEXIBLE CLOSURES FOR CHILLROOM DOORWAYS

- EXCELLENT VISIBILITY!
- TEMPERATURES PROTECTED!
- ECONOMICAL SOLUTION TO DOOR PROBLEMS!

Minikay

DEHYDRATION FOR PERMANENTLY DRY INSULATION

- MAINTAINS FULL INSULATION EFFICIENCY!
- ELIMINATES RE-INSULATION COSTS!
- REDUCES PLANT RUNNING COSTS!

Minikay Limited

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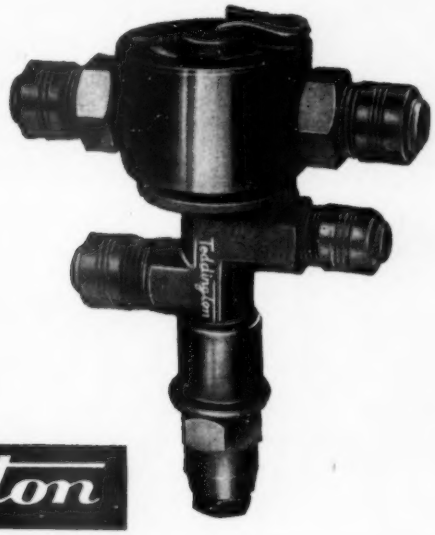
Telephone : LONdon Wall 6581
Telegrams : Minikay Stock London · Cables : MINIKAY LONDON

Trouble-free control by **Teddington**

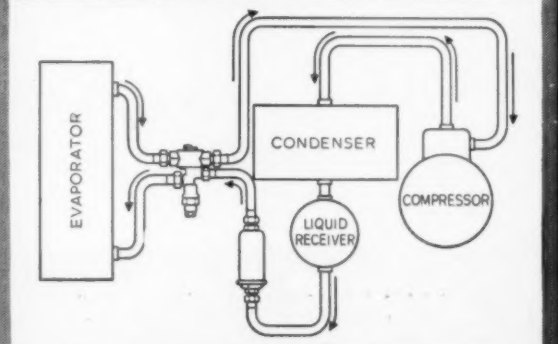


Teddington

Type RD Thermostatic Expansion Valve

FOR FREON 12 AND FREON 22

- ✻ Self-contained—no capillary or phial
- ✻ Definitely non-reversing under all conditions
- ✻ Can be used on low capacity plants without 'hammer
- ✻ Limit-charged, giving overload protection to motor on starting
- ✻ Self-equalising



Typical Vapour Compression Refrigeration Circuit incorporating Teddington Type RD Expansion Valve

The ideal unit for:

REFRIGERATED VANS

INDUSTRIAL HERMETICALLY SEALED UNITS

BLOWER COIL INSTALLATIONS

SYSTEMS USING HOT GAS DEFROSTING

For further technical information write for leaflet TRC 9

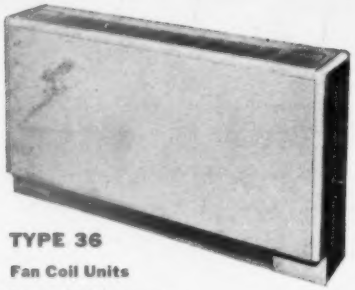
TEDDINGTON REFRIGERATION CONTROLS LIMITED

SUNBURY-ON-THAMES · MIDDLESEX **SUNBURY-ON-THAMES 466**

TRC9

Some of the specialised

FOR AIR CONDITIONING AND

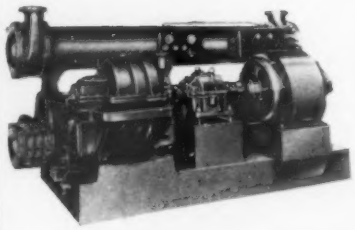


TYPE 36

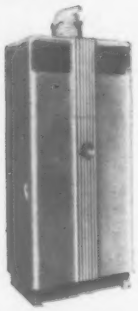
Fan Coil Units

Low and high pressure.

17M Centrifugal Refrigerating Units
Also 19C Hermatic Centrifugals



Will give long efficient service with only minimum maintenance and will supply chilled water for all types of air conditioning systems, or will chill brine or condense vapours over a wide range of temperature levels. They give precise, automatic control at desired levels. Refrigerating capacities 100-4,000 tons.



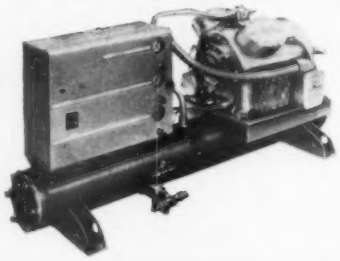
TYPE 50

Laboratory Air Conditioners

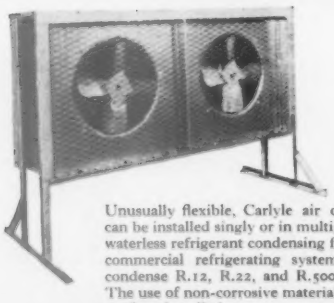
Give precision control of temperature and humidity. They ensure year round control of temperature and humidity to within ± 1°F and ± 1½% R.H. These Carlyle units are the result of years of specialized experience in all phases of atmosphere control involving application of air conditioning and refrigeration to industrial plants and processes. Capacities from 29,000 to 80,000 Btu/hr.

TYPE 5 & 6

Open and Hermetic Compressors



Unequalled for performance flexibility. Feature automatic unloaded starting. Automatic capacity control. Positive pressure lubrication. Carlyle Open and Semi-hermetic reciprocating compressors with built in capacity control are designed for speeds up to 1,750 r.p.m. with belt or direct drive. Available to match loads up to 100 tons.



TYPE 9

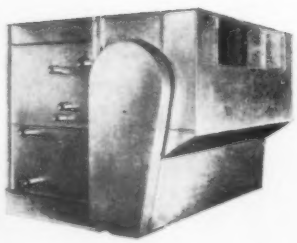
Air Cooled Condensers

Unusually flexible, Carlyle air cooled condenser units can be installed singly or in multiples or provide remote, waterless refrigerant condensing for air conditioning and commercial refrigerating systems of all sizes. They condense R.12, R.22, and R.500 with equal efficiency. The use of non-corrosive materials makes them ideal for outdoor installation.

TYPE 9

Evaporative Condensers

Used in place of water cooled condensers, the Carlyle Evaporative Condenser can affect material savings in operating cost of as much as 95% in water supply requirements, and up to 15% in power costs. Water pumping costs are also drastically reduced. Carlyle Evaporative Condensers can be used for food freezing and storage, product and chemical processing and similar industries where refrigeration plays a vital part. Capacities from 10 to 250 tons.



CARLYLE AIR CONDITIONING & REFRIGERATION LTD

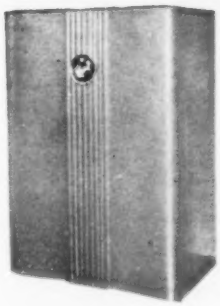
CARLYLE products

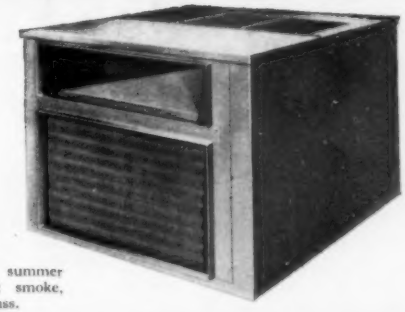
REFRIGERATION APPLICATIONS

TYPE 50

Self-contained Air Conditioners

Ideal for use singly or in multiples. Housed in an attractive cabinet, they utilise serviceable hermetic refrigerating compressors with air or water cooled condensers. Capacities of these units are in various sizes and range from 2 to 15 tons.

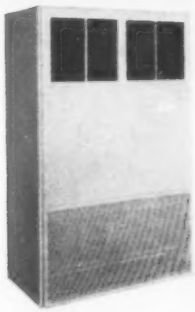




TYPE 64

Heat Pumps

Winter heating, summer cooling without smoke, fuel storage or fuss.



TYPE 38

Split Packaged Air Conditioners

Fan Coil Unit. Air cooled Condensing Unit.

Room Air Conditioners

In several sizes from 9,000 to 20,080 Btu/hr. capacity.

TYPE 41

Large Self-Contained Air Conditioners

Available in capacities from 15 to 45 tons. Provide all the air-conditioning functions, heating, cooling, dehumidifying, filtering and circulating. For use with ducted systems only, this unitary equipment enables installations totalling hundreds of tons to be effected quickly and economically.

To meet requirements of temperature and humidity... specify **CARLYLE**

CARLYLE

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WHitehall 5356

LOWEST COST

DEEPEST FREEZE BIGGER PROFITS!

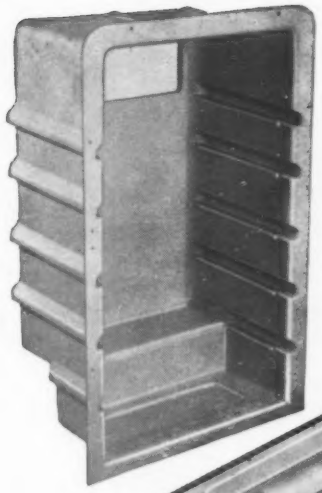
ISOL deepfreeze

AND HERE'S WHY YOU'LL MAKE BIGGER PROFITS WITH ISOL NORWAY'S TOP SELLING DEEPFREEZE

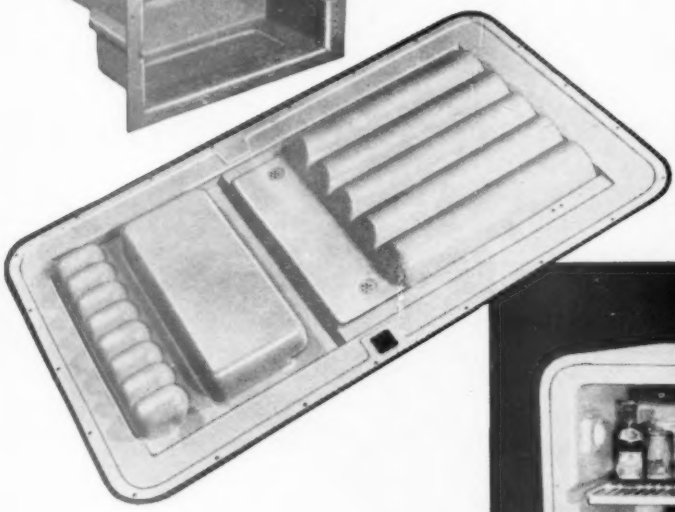
- ★ In the ISOL range—6.5 cu.ft. to 20.5 cu.ft.—there is a model to suit the exact requirements of your customer.
- ★ An ISOL Deepfreeze is a *top quality* unit yet priced lower than any comparable unit.
- ★ All ISOL models have compartments and specially designed baskets to facilitate easy storage.
- ★ Positioning of elements within the compartment walls gives *ultra fast freezing.*
- ★ Temperatures down to −20° F. provide safer storage.
- ★ All ISOL models carry a 5 year guarantee on sealed unit, 1 year on cabinet.
- ★ Only an ISOL offers so much for so little.

ISOL DEEPFREEZE

full details of ISOL range from
Strommen Engineering Ltd., Essex Hall, Essex Street, London, W.C.2. **COVent Garden 1425/7**



Vacuum-formed 'Flovic' makes the ideal lining for Lec 'Colonial' refrigerators



Linings made from 'Flovic' vinyl copolymer sheet for the 'Colonial' refrigerator made by Lec Refrigeration Ltd., Bognor Regis, Sussex.

BECAUSE tough high-gloss 'Flovic' vinyl copolymer sheet shows little tendency to necking or thickness variation, even when considerable stretching is involved, it can be vacuum-formed into intricate, deep-drawn shapes. 'Flovic' is also easy to blank and drill.

High quality, excellent definition and good impact and tensile strengths are characteristics of mouldings produced from 'Flovic'. The complete absence in 'Flovic' of heavy metals and any harmful constituent, make this I.C.I. material ideal for the liners, door panels and other fittings in refrigerators.

'FLOVIC'

'Flovic' is the registered trade mark for the vinyl copolymer sheet and foil manufactured by I.C.I.

ICI

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1

PFLS

Tecumseh

brings you yet another entirely new line of

TINY-T Compressors

With the new Tecumseh high-speed T compressors our customers can not only now reduce the size of their refrigerator machine compartment and increase storage capacity without extra cabinet cost, but they can at the same time effect considerable saving in the price of the compressor. Manufacturers can now choose either Tiny-T or Pancake models—whichever meets their requirements. Low headroom or slim front-to-back dimension.

Models are available for freezers—and domestic refrigerators.

You earn important savings with a Tiny-T model compressor . . . less cost, less weight, less size than previous single cylinder internally spring mounted compressors.

10 to 16 lb. less weight means your freight costs will drop substantially. These new Tiny-T compressors are just one more example of Tecumseh engineering Vision—Why not turn it to your use?

COST REDUCED • WEIGHT REDUCED • SIZE R

Manufactured by

L. STERNE & CO. LTD.

HERMETIC UNIT DIVISION (LICENSEES OF TECUMSEH PRODUCTS CO. MICH. U.S.A.)

Works: **KELVIN AVENUE, HILLINGTON, GLASGOW, S.W.2**

AS FROM SEPTEMBER 30 THE HERMETIC UNIT DIVISION GENERAL SALES OFFICE WILL BE LOCATED AT:
KELVIN AVENUE, HILLINGTON, GLASGOW, S.W.2
Hermetic Unit Division Homes Sales Department:
Stern House, 36-38 Peckham Road, London S.E.15 Telephone RODney 6300

ngineering **VISION**

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Smithfrige-McCray

GIVES **EXTRA** REFRIGERATED DISPLAY

***The* NEW**
Self Service
DAIRY PRODUCE CASE

This 12 ft. case has an extra refrigerated shelf which brings the total display area up to 68¼ sq. ft., **an increase of 14¼ sq. ft.** on our standard Dairy Produce Case, with no increase in the overall size. All the plus features of Smithfrige-McCray are embodied in this new case, which is also available in standard 8 ft. lengths.
Ask your Refrigeration Dealer or

write direct for details

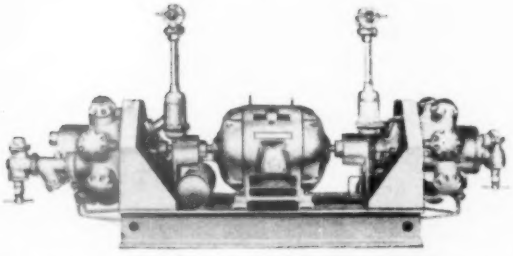
SMITHFIELD REFRIGERATOR COMPANY LIMITED
HIGH STREET, HORNSEY, LONDON, N.8

Smithfrige-McCray
KOLDFLO
SELF SERVICE CASES

CHRYSLER AIRTEMP

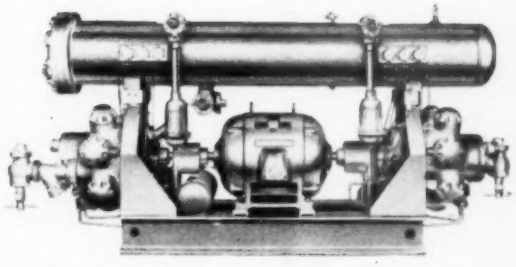
REFRIGERATION and AIR CONDITIONING EQUIPMENT FOR EVERY NEED

COMPRESSOR UNITS



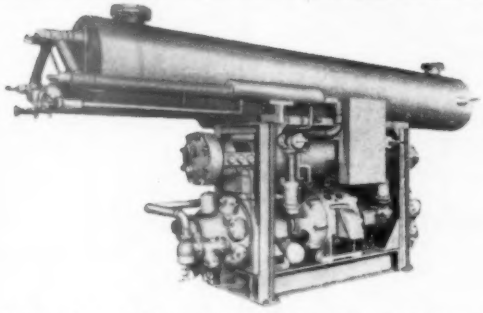
Especially designed for commercial and industrial application with capacities of 10- 125 H.P. for use with Freon. Compressors incorporate these exclusive features, capacity regulator and starting unloader, forced feed lubrication, dynamically balanced crankshaft, oil separation, refrigerant seal, large area non-flexing valves, gear type pressure oil pump.

CONDENSING UNITS



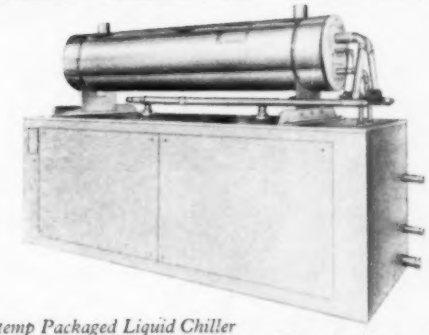
With capacities from 10 to 125 H.P. these Airtemp Condensing Units lightweight and economical to operate incorporating direct drive with forced feed lubrication and automatic capacity reduction.

PACKAGED LIQUID CHILLERS



Airtemp Packaged Liquid Chillers in multiple range through 35 H.P. to 100 H.P. Compact, purpose-made packaged unit, single and dual systems, delivered in one piece ready for commissioning. Refrigerant 22 or 12.

S.W. SERIES LIQUID CHILLERS



Airtemp Packaged Liquid Chiller through range 7½ to 45 H.P. Compact, high capacity serviceable sealed radial type compressor. Direct expansion chiller using advanced innerfin tubing design for greater heat transfer.

COME AND SEE

the AIRTEMP EQUIPMENT on STAND 119

at the HEATING, VENTILATING & AIR CONDITIONING EXHIBITION at OLYMPIA

26th SEPT.-6th OCT. 1961

1488/MR/9

CHRYSLER AIRTEMP LTD., 68 KNIGHTSBRIDGE, LONDON, S.W.1. KNightsbridge 6821 (10 lines)

forming a good impression

Everyone gets a good impression from Styron . . . the designer who relies on it to reproduce his flowing lines, intricate detail, delicate colour schemes . . . the moulder who finds he can vacuum form complete, flawless refrigerator liners in one time-saving operation . . . the housewife who discovers clean, stainless Styron in her new refrigerator. Styron's ability to please so many people is the reason it's used in so many refrigerators. To get an even better impression of Styron possibilities please write for Booklet No. 211.

with STYRON Polystyrene

Styron is a trade mark of the Dow Chemical Company USA
Manufactured by Distrene Limited
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British Resin Products Ltd A COMPANY IN THE DISTILLERS PLASTICS GROUP BRP

SALES AND TECHNICAL SERVICE DEVONSHIRE HOUSE PICCADILLY LONDON W1 HYDE PARK 0151

Distillers Plastics Serve Everyman

STC HERMETIC SEALS

IN APPLICATIONS RANGING FROM TRANSISTORS TO REFRIGERATORS, STC HERMETIC SEALS HAVE PROVED THEIR PERFORMANCE AS HIGH GRADE COMPONENTS

From their wealth of experience and "know how" in so many fields, STC have evolved a range of seals to meet the most exacting standards of hermetic sealing. STC hermetic seals are available for many applications including:

- Lead through insulators with flexible or solid terminations for transformers, relays etc.
- Crystal base seals.
- Refrigerator seals.
- End seals for cylindrical components.

Write for publication MK/153 which gives details of these and other STC Hermetic Seals.

COMPONENTS GROUP

61/8MK

Standard Telephones and Cables Limited

TRANSISTOR DIVISION: FOOTSCRAY · SIDCUP · KENT

completely packaged

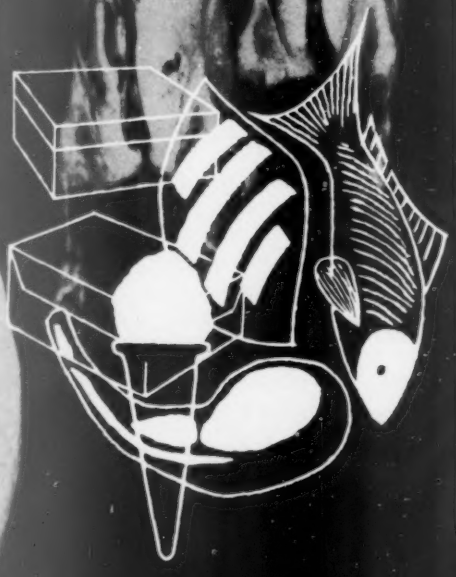
TEMKON

auto-defrost refrigeration

for cold store applications

TEMPERATURE RANGE:
−5°F to 38°F (water cooled)
+15°F to 38°F (air cooled)
Completely automatic hot gas defrost
Entirely self-contained with hermetically sealed refrigeration system
Easily installed in any cold room.
More cold room space—
unit only projects 10″ into store
Suitable for overall wall thickness of from 3″ to 12″
Only simple external wiring required
Air or water cooled plants
Low in cost and economical in operation

For butchers and meat storage
fishmongers and fish storage
frozen food storage
ice cream storage
industrial applications



Please send details of the TEMKON COMPLETELY PACKAGED AUTO-DEFROST REFRIGERATION

NAME .....
POSITION .....
COMPANY .....
ADDRESS .....
.....
.....

P.6039

TEMPERATURE LIMITED

BURLINGTON ROAD FULHAM LONDON S.W.6 ENGLAND PHONE RENOWN 5813 (P.B.X.) CABLES TEMTUR LONDON
MAKERS OF THE WORLD'S QUIETEST ROOM AIR CONDITIONER

P6039

BATTS

the little word filling the large spaces in marine insulation

Batts, batts and more batts. Stillite mineral wool *batts*. Definitely the most economical way of insulating large spaces. Definitely more accommodating, lighter, easier to handle than you'd have thought possible. All made of Stillite mineral wool (amazing stuff). All in large pre-formed rectangular blocks. Simple to cut. Will defy fire, rust, vermin, dampness and decay. Indifferent to post-installation welding. Manna indeed where consistent density is imperative and cost must be cut at all cost. Can't have enough of them. *Batts*. Stillite *batts*—the *batts* that go down to the sea in ships all the better insulated because of them.

Our highly competitive prices will stand out in the quotation and details we hope you'll demand of us.

STILLITE

Regd. Trade Mark

To STILLITE PRODUCTS LTD., 15 Whitehall, London, S.W.1.

Please send details of Stillite products for Marine use.

NAME .....

ADDRESS .....

.....

just attach to letterhead Modern Refrigeration

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A member of the TURNER & NEWALL GROUP

ISCEON

for Refrigeration

BOILING POINTS OF ISCEON COMPOUNDS

	CENTIGRADE	FAHRENHEIT
ISCEON 113 ($CCl_2F.CClF_2$)	47.6°	117.6°
ISCEON 11 (CCl_3F)	23. 8°	74.8°
ISCEON 21 ($CHCl_2F$)	8.9°	48.0°
ISCEON 114 ($CClF_2.CClF_2$)	3.6°	38.4°
	0°C	
ISCEON 12 (CCl_2F_2)	—29.8°	—21.6°
ISCEON 22 ($CHClF_2$)	—40.8°	—41.4°
ISCEON 13 ($CClF_3$)	—81.5°	—114. 7°
ISCEON 14 (CF_4)	—128°	—198.4°

Isceon chlorofluorocarbons are RELIABLE, having high levels of chemical and thermal stability, and are produced to very high purity specifications. Isceon refrigerants are SAFE—being non-inflammable and non-combustible. Their vapours are non-irritant and non-toxic in relatively high concentrations. Isceon refrigerants are available with boiling points of –128°C. upwards.

PRODUCTS OF IMPERIAL SMELTING

CONSOLIDATED ZINC CORPORATION (SALES) LIMITED, LONDON S.W.1

SEARLE EXPANSION

continues with the growth of new and exciting markets—expansion is a commonplace word at Searles, for as you know we manufacture 'direct expansion cooling coils' together with 'water coils' and 'steam coils'. We also specialise in the production of coils for room air conditioners, including window type units. Both condensers and evaporators are carefully engineered to provide efficient performance in any circumstances. This calls for the robust construction and versatility of design for which Searle-Bush coils are renowned. The extensive range of fin/tube combinations permits coils as unusual as those calling for 17 fins per inch, or split banks, as well as evaporators having progressive fin pitch. Why not write for literature?

P.S. The photograph above is of an extension now in progress to Europe's largest coil works.

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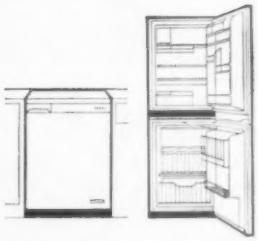
SEARLE MANUFACTURING COMPANY LIMITED · LONDON AND FAREHAM

NEW! Kenwood's best-sellers in refrigeration—

FREEZER AND REFRIGERATOR TO MATCH!

KENWOOD FREEZER HF42A KENWOOD REFRIGERATOR HR52A

BIG CAPACITY-
LOW PRICE!



For the first time ever . . . complete refrigeration in two separate matched units . . . at really down-to-earth prices! The Kenwood HF 42A meets the growing demand for a *real* home deep-freezer—with 4.2 cu. ft. of genuine sub-zero degree storage. And the matching Kenwood HR 52A Refrigerator packs in a full 5.2 cu. ft. of storage for all weekly needs. Superbly designed, expertly planned to make the most of their big capacity, these two are your best sellers in refrigeration!

Side by side under one double-width table top (optional extra, main illustration) . . . one atop the other (right) . . . under a built-in counter or separately . . . left or right hand door opening . . . the Kenwood pair fit handsomely into any shape or size kitchen!

RETAIL PRICES

Freezer HF 42A	*£60.14.10 + £11.14.2 PT*
Refrigerator HR 52A	*£51.2.6 + £9.15.6 PT*
Optional working surface	*£3.3.0*

Every woman wants a

WPS 212

Kenwood Norge 'Never-D-Frost' Refrigerator/Freezers —the most glamorous refrigerators in Britain!

With these two magnificent models, Kenwood almost makes kitchen larders obsolete! Each has a separate, zero-degree genuine deep freeze compartment—as big in itself as many ordinary refrigerators! And the larder-sized main compartments are entirely self-defrosting. Handsomely styled with brilliantly planned and fitted interiors, these two meet the public trend towards real home deep-freezes *and* bigger-capacity refrigerators combined!

KF 13

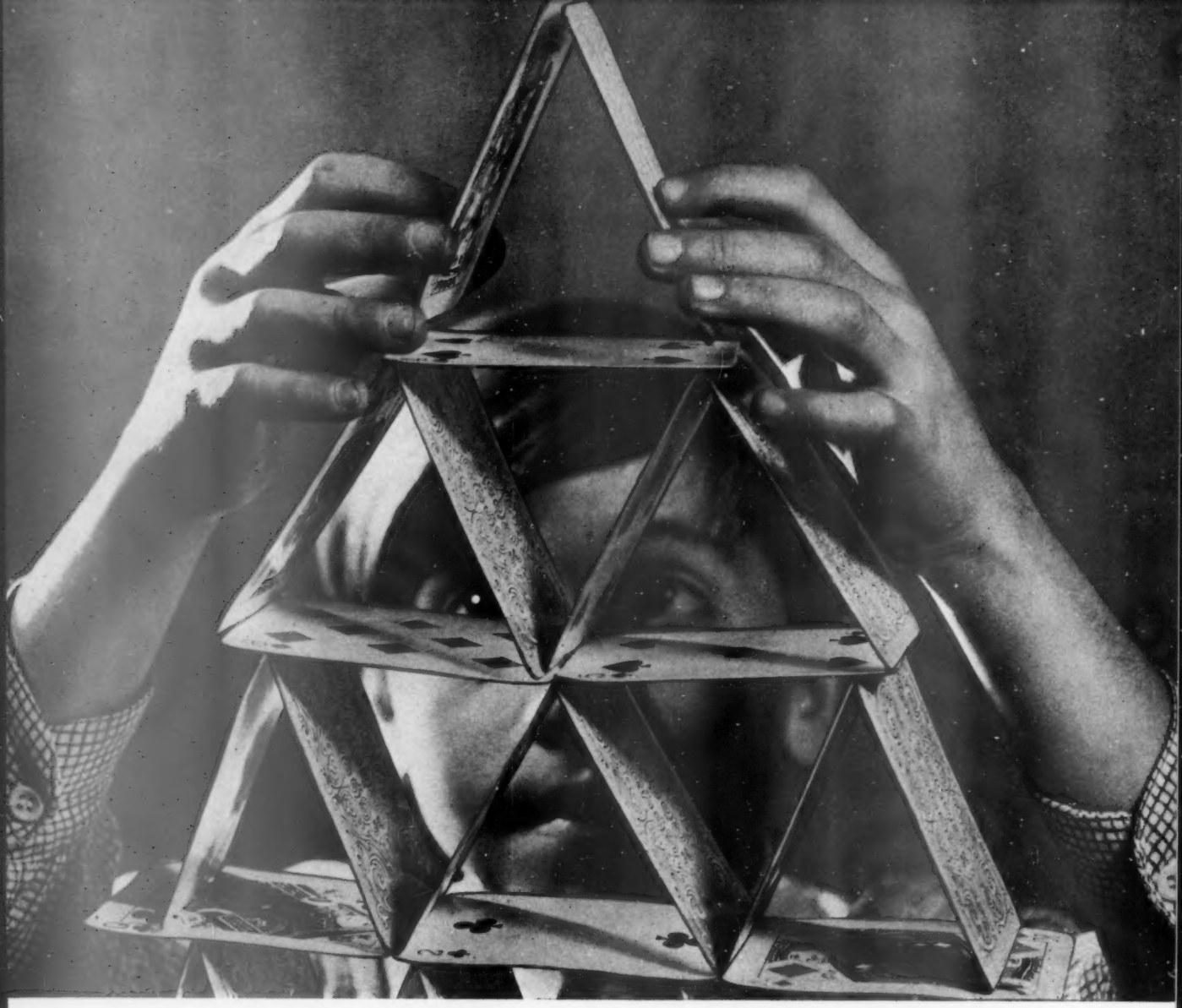
nearly 3½ cubic feet Deep Freeze capacity (over 1 cwt)
13.3 cubic feet capacity
20.9 square feet shelf area
RECOMMENDED SELLING PRICE **£189.0.0**

KF 12

nearly 2 cubic feet Deep Freeze capacity (over ¼ cwt)
12 cubic feet capacity
18.3 square feet shelf area
RECOMMENDED SELLING PRICE **£155.0.0**

For full information and details of generous co-operative advertising terms, write to Dept. MR. 35
KENWOOD MANUFACTURING (WOKING) LTD · OLD WOKING · SURREY

Kenwood kitchen!



control

. . . it's often trickier than it looks, even when you hold all the cards. But not for Ranco. We're aces at the game. Ranco controls for heating and refrigeration are the finest you can lay hands on. And more controls for fridges come from Ranco than from anybody else in the world. Nearly 50 years' specialisation in control manufacture has taught us all the tricks there are to know . . . about everything from thermostats and relays to car heater controls . . . reversing valves to compressor motors. And all our products are inspected and re-inspected to ensure the highest quality and reliability.

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Ranco – the biggest name in small controls

DAVID SCOTT *NEW* Molecular Sieve DRIERS

LOW INITIAL COST *PLUS* 9 times greater efficiency than Standard Driers

This is good news for all sealed refrigeration system manufacturers. David Scott high side molecular sieve driers are now nine times more efficient than standard driers. With a desiccant consisting of a molecular sieve filled with type 4A 8 x 12 mesh beads, they have actually nine times the normal adsorption. Consider the economic advantage. With David Scott high side driers you save size and weight.

FIRST CLASS CONSTRUCTION

Construction of these remarkable new driers is carried out in spun copper shell with a desiccant between two fine-mesh strainers. Outlets screen is of bag construction with secure retention in a brass ring pressing. This is formed from a 150 mesh twill weave wire cloth or equivalent in either phosphor bronze or monel.

PRE-PURCHASE PROTECTED

The greatest care is taken to ensure 100% efficiency. All driers are manufactured and stored in an air-conditioned atmosphere.

EASY AND SAFE TRANSPORTATION

Though there is the minimum risk of moisture adsorption from the surrounding atmosphere, David Scott new high side driers can be individually sealed before leaving the factory. All driers are shipped in hermetically sealed canisters.

Inlet and outlet connections conform to manufacturers own requirements.

Other David Scott products include RECHARGEABLE DRIERS from ¼" o/d to 1⅛" o/d pipe, and ACCUMULATOR DRIERS with copper shell squeezed and silver soldered at each end.

★ *A special feature of the David Scott service is the manufacture of driers to clients own specifications.*

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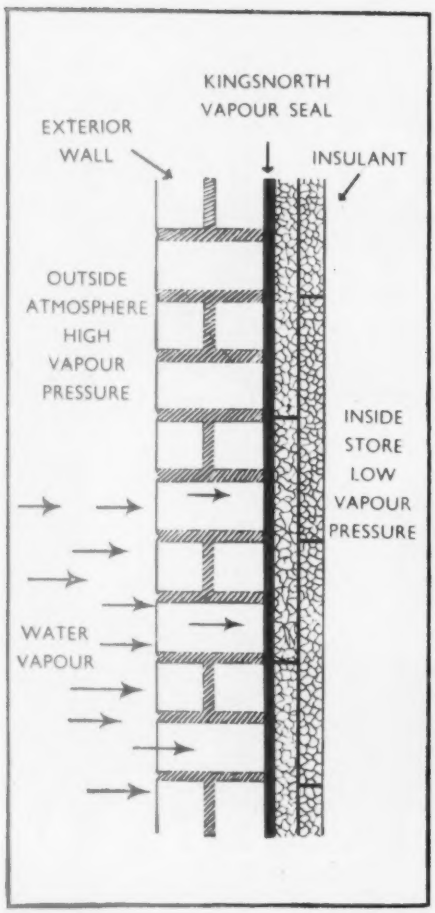
Paint Specialists since 1840

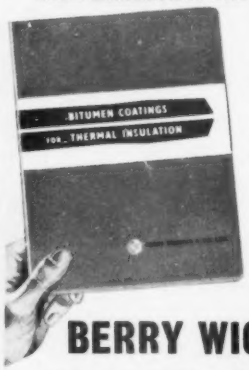
KINGSNORTH Vapour Seal No. 25

* **Reduces vapour transmission**
* **Protects insulation**
* **Increases thermal efficiency**



Specially developed by Berry Wiggins after long research into the problems of providing an efficient impermeable vapour seal. Kingsnorth No. 25 increases thermal efficiency and minimises deterioration from condensation and freezing. In one year in this country approximately 33 gallons of vapour will penetrate a chamber 25 ft. x 40 ft. x 15 ft., operating at 5° F. By sealing with Kingsnorth Vapour Seal No. 25 penetration can be reduced to approximately $\frac{3}{4}$ of a gallon.

SEND FOR THE FREE COMPREHENSIVE REFERENCE MANUAL BY BERRY WIGGINS



Contains information, specifications and covering capacity tables on Bitumen Vapour Seals, Adhesives, Waterproofing and Gas Sealing Coatings for use in low temperature insulation. Indispensable to those concerned with the building and maintenance of cold stores.

BERRY WIGGINS & CO. LTD.

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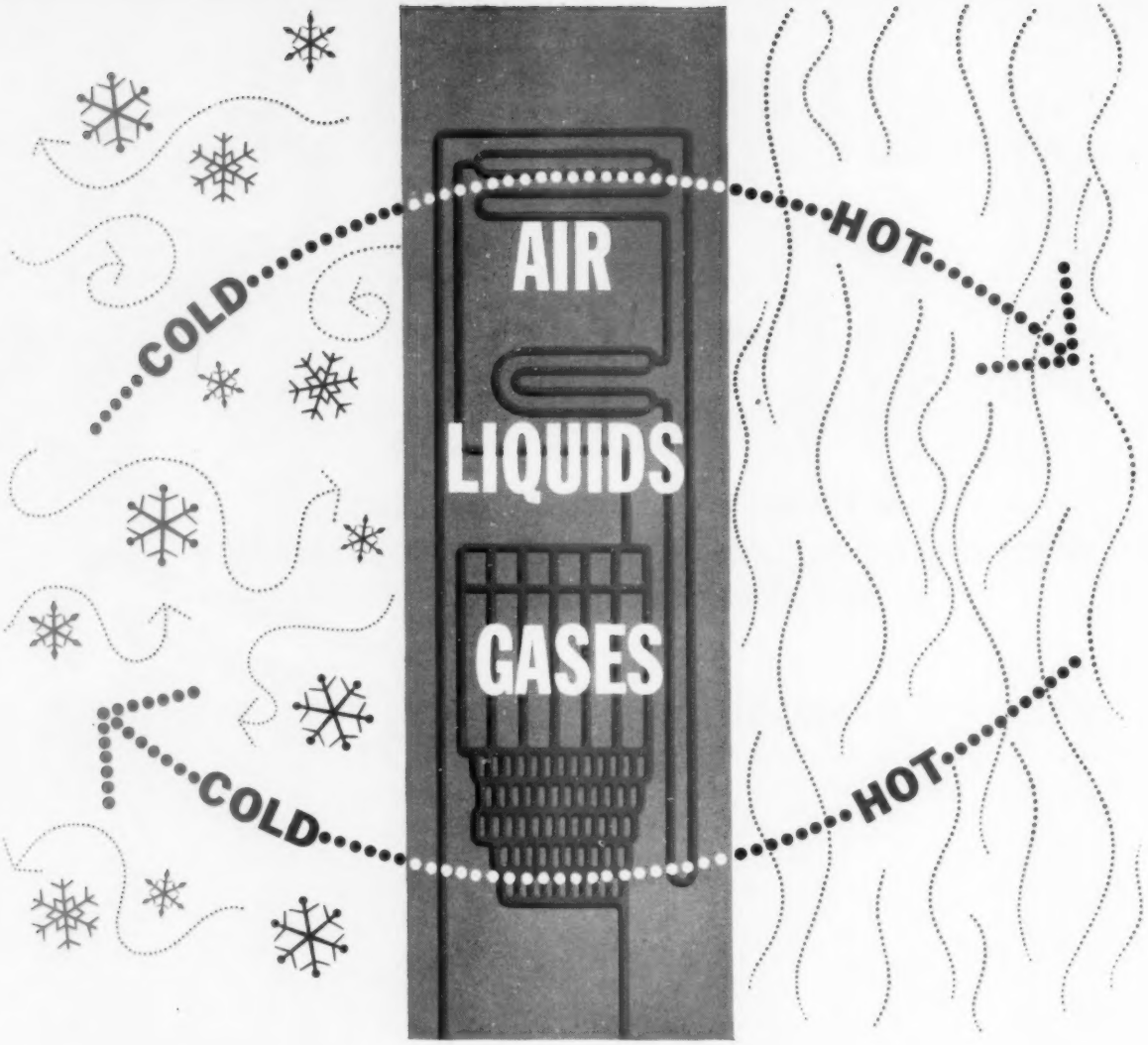

Heat transfer—hot to cold, cold to hot—is the specific purpose of two important **IMPALCO** products. These highly specialised heat exchange products—Roll-welded Heat Transfer Sheets and Tube-in-Strip—are made by advanced techniques from high quality materials.

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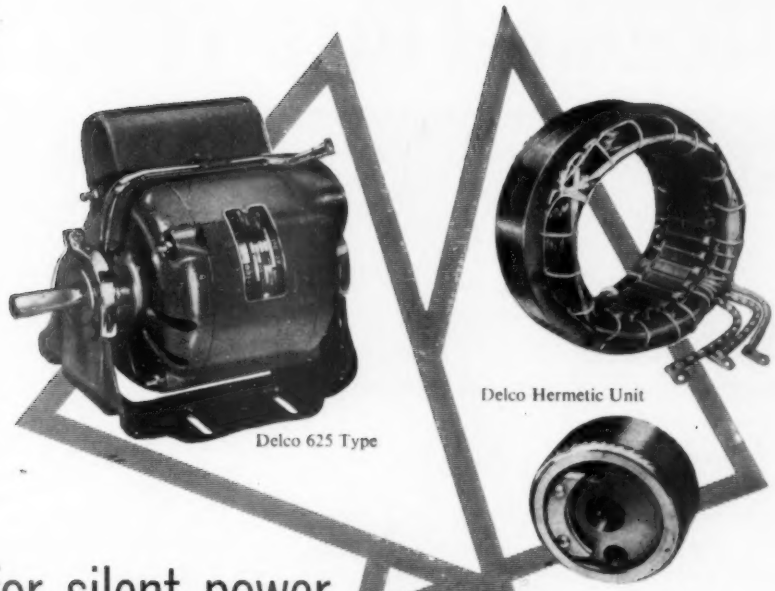
Imperial Aluminium Company Limited · Birmingham



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DELCO electric motors

If you are designing new refrigeration equipment or redesigning old, you will find a Delco motor that's just right for the job. In addition to the renowned silent dependability there are exclusive features which make a Delco Motor the obvious choice for high quality equipment. Call in a Delco Engineer now to discuss present and future requirements, or write for further information.

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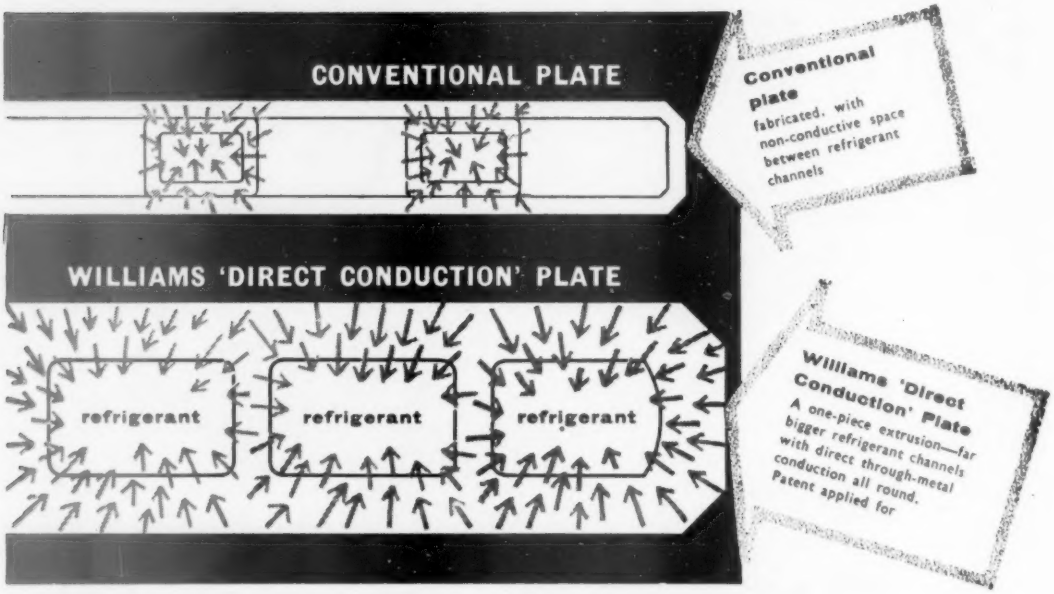
This is what produces higher quality—with

Williams Plate Freezers


CONVENTIONAL PLATE
WILLIAMS 'DIRECT CONDUCTION' PLATE
refrigerant
refrigerant
refrigerant
Conventional plate
fabricated, with non-conductive space between refrigerant channels
Williams 'Direct Conduction' Plate
A one-piece extrusion—far bigger refrigerant channels with direct through-metal conduction all round. Patent applied for

Here's Why

The beneficial effects of rapid freezing have been well known for a long time. Smaller crystal size means less damage to fibres, with reduced losses in flavour and nutrient value. With the development of the Williams 'Direct Conduction' double contact alloy plate, faster freezing has been made possible with its attendant advantages of higher quality and greater production capacity.

Here's How

Unlike conventional fabricated plates, whose efficiency is limited by the wider pitching of refrigerant tubes and the space between them—the Williams 'Direct Conduction' plate is a one-piece allow extrusion. It is totally filled with adjacent refrigerant passages with direct through-metal conduction on all sides. Result—significantly faster freezing.

Here are some of the figures

PRODUCT	TYPE OF PACK	TEMPERATURE	USED TO TAKE (mins)	NOW TAKES (mins)
Fish	Tray 2″ thick	+40°/−5°F	105	50
Peas	Carton 1⅛″„	+57°/−5°F	120	40
Meat	Paper Wrappers ⅛″ thick	+38°/−5°F	65	12

WILLIAMS of LONDON

Refrigeration engineers. Individual machines or complete installations to customers' requirements.

in association with GRASSO of Holland

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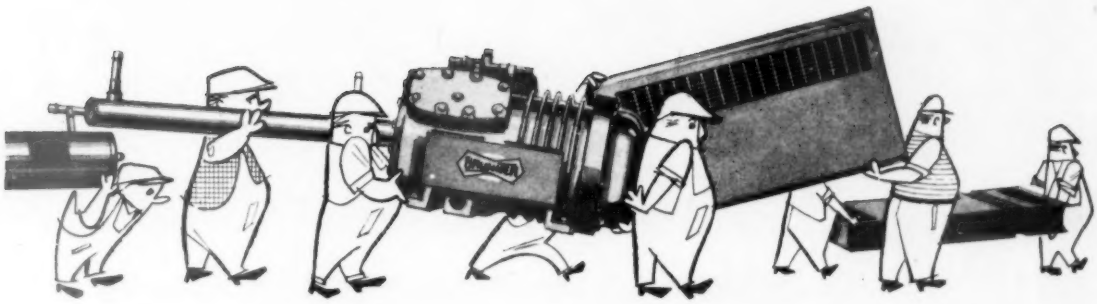
we are exhibiting



where? At the 1st International Heating Ventilating and Air Conditioning Exhibition to be held at Olympia, London, England.

when? From September 26th to October 6th 1961.

why? Because we have a complete range of quality equipment everyone in the Heating and Air Conditioning industries will want to see.

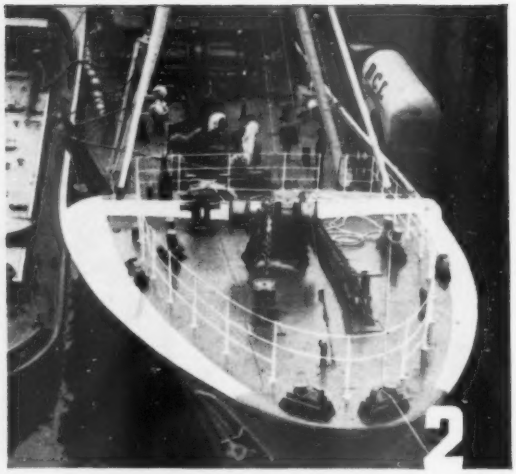
what are we showing? Dunham-Bush are well known for the wide range of quality Convectors, Fan-Convectors and Fin-vector heaters, and equally well known for their superb Industrial Blower Heaters—all of which will be featured on our stand. At the same time a complete Vari-Vac Differential heating system, together with many steam and hot water specialities will indicate the overwhelming advantages to be offered by a company manufacturing such a complete line of heating equipment. In recent years Dunham-Bush have developed a completely new range of components for Refrigeration and Air Conditioning applications, Chillers, Condensers, Heat Interchangers and Motor Compressors are all components designed for Central Station cooling plant, as well as packaged air conditioning units. New Remote Room Conditioners offering complete versatility will also be on view.

will you pay us a visit? We are sure you will be satisfied with what you see. If you would like any technical literature before the exhibition please write to us. Literature will be available on the stand. We look forward to meeting you there.

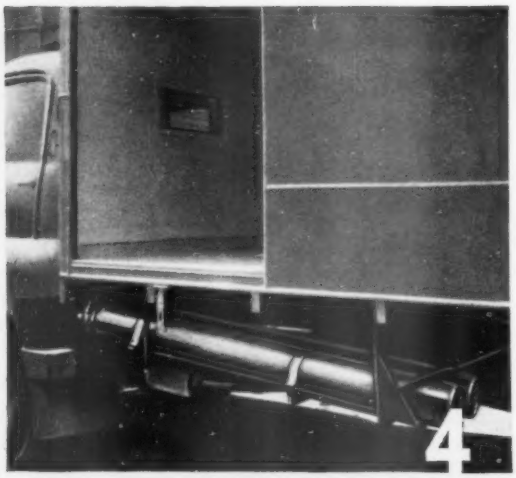
stand 226

DUNHAM-BUSH LTD FARLINGTON PORTSMOUTH HANTS ENGLAND TELEPHONE COSHAM 70161-4

DB 51



DISCHIL FOOD PRESERVATION SERVICE **—gives immediate temperature drop**



When DisChiL is injected into an insulated container, with the doors closed after loading, the inside temperature drops to sub-zero—or any desired low temperature—in seconds. Now, there are four ways to obtain this service. The choice is yours.

1. **Pull in at the nearest DisChiL depot**
2. **For a large requirement, arrange for a DisChiL road tanker to call, by appointment**
3. **Keep your own bulk supply of DisChiL on your premises**
4. **Have a DisChiL cylinder mounted on your van**

If you will write to us, we will be glad to give you details of any or all of these methods.

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Carbon Dioxide Department, Devonshire House, Piccadilly, London, W 1. Telephone: MAYfair 8867

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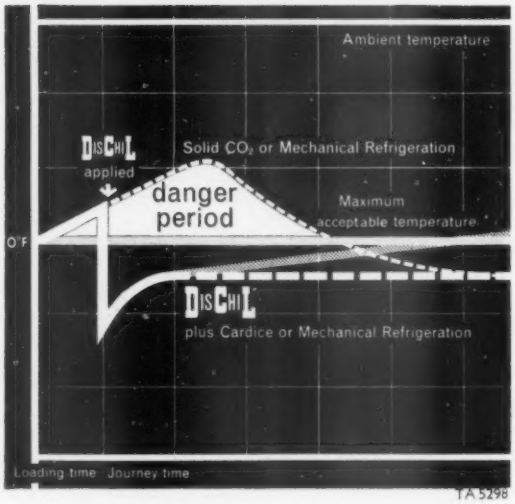

UDEC

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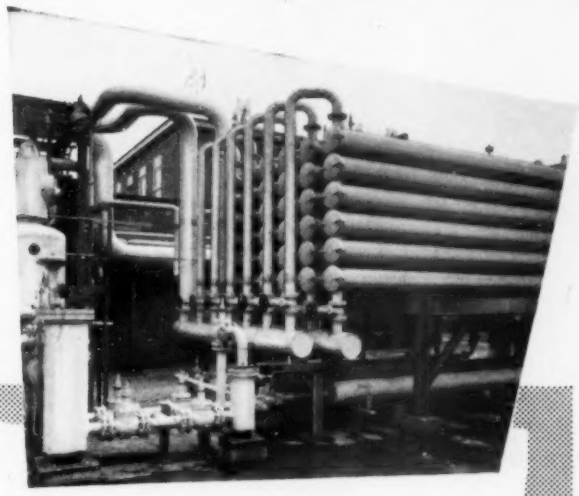
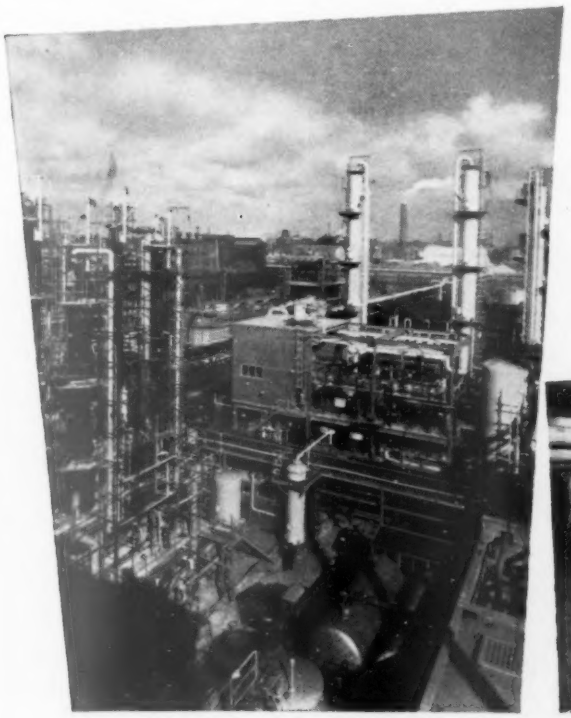


and ACRYLONITRILE



UDEC refrigeration equipment absorbing 1000 horsepower provides controlled cooling at various points in the new I.C.I. acrylonitrile monomer plant in the Cassel Works of I.C.I at Billingham.

The plant will provide the plastics and synthetic fibres industries with the vital acrylonitrile monomer.

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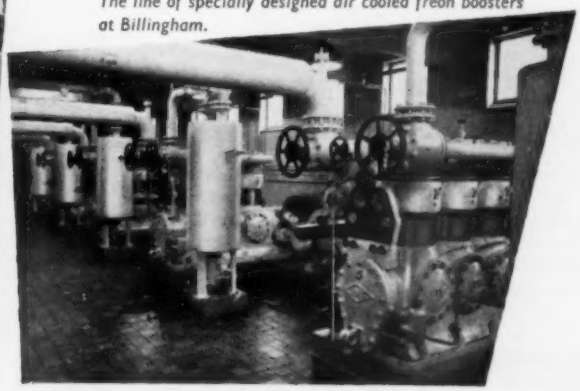
The line of specially designed air cooled freon boosters at Billingham.



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Look for the original **LEVIN** *model with the engraved* **LEVIN** *name.*

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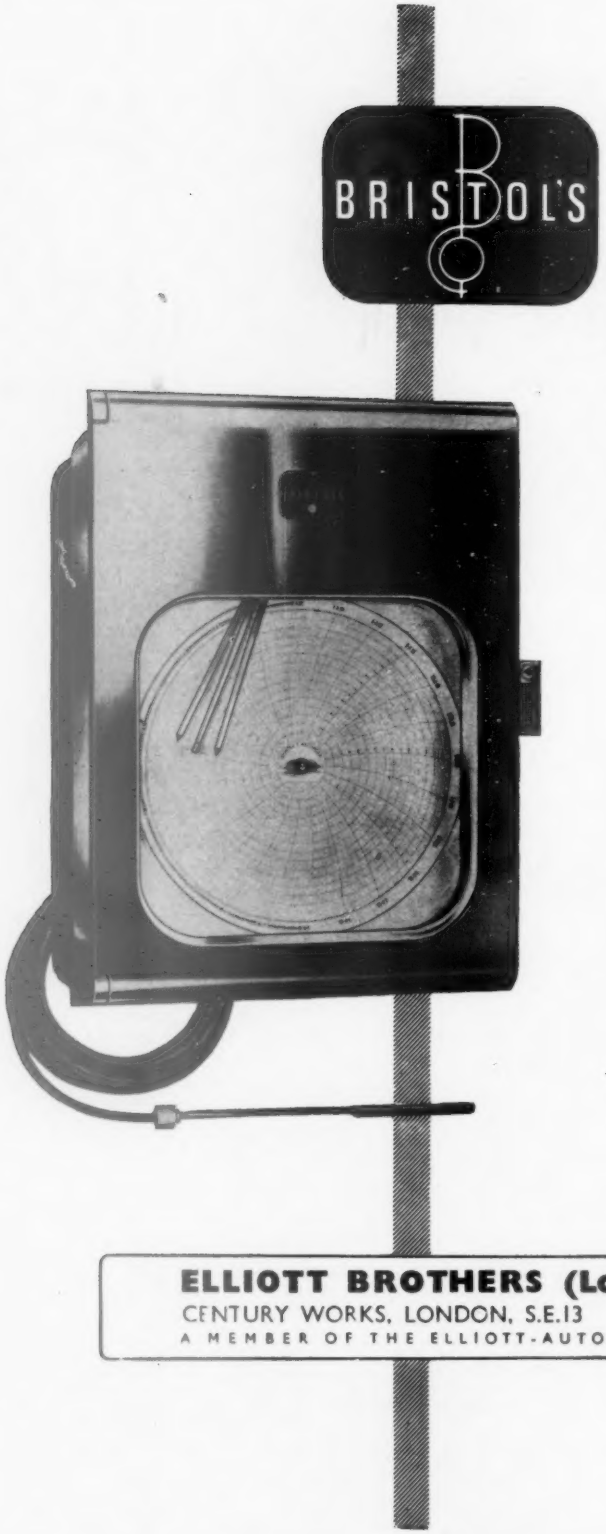

BLOOD BANK RECORDING THERMOMETERS

"*A blood bank refrigerator, not equipped with a constant recording thermometer, may go off during the night because of power failure. Power is restored, but not until after the blood has become warm. The blood is recooled and the hemolysis that occurs when the red cells are brought to body temperature at the time of transfusion may not be detected unless a sample is centrifuged. Severe hemolytic reactions may therefore result.*"—CARL V. MOORE, M.D., The Journal of the American Medical Association.

Bristol's Blood Bank Recording Thermometers ensure

- PROTECTION AGAINST FREEZING OF BLOOD BANK due to refrigerator thermostat failure.
- A WARNING OF DANGER when the temperature deviates from the safe range.
- AN ACCURATE CHECK ON TEMPERATURES by providing a continuous record of conditions in the blood bank.

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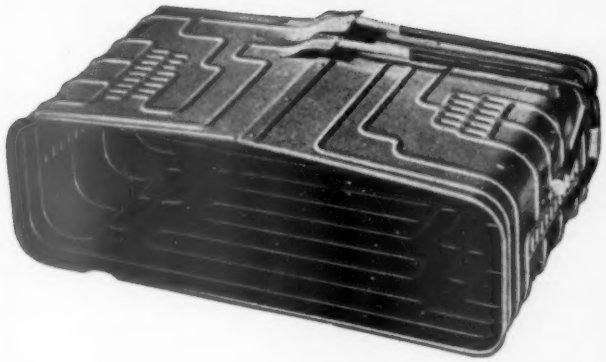
Marston Evaporator Units

Light alloy roll-welded evaporator units offer many advantages: superior performance, light weight, attractive appearance, flexibility of design, competitive prices. A production line specially equipped for the fabrication of these units is operated by Marstons, specialists in heat transfer for sixty years. Why not discuss your design and production problems with them?



Marston Excelsior Ltd.,
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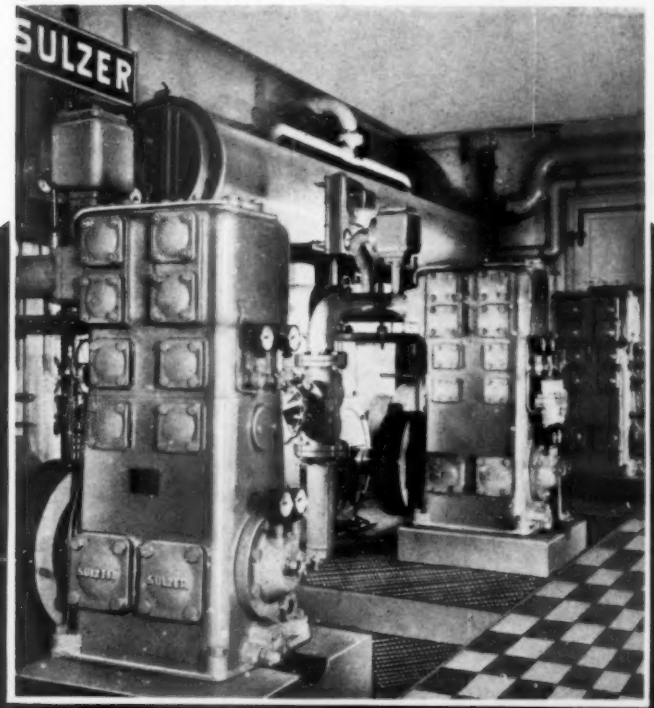
Oil-Free Refrigeration Compressors for Ammonia and Freon

By the new SULZER refrigerating compressor with labyrinth piston and gland.

The illustration shows No.1 in the series

2 Compressors Type K90-1A and 1 Type K80-1A at an artificial ice rink.
Total Capacity 3,200,000 BTU/hr.



SPECIAL FEATURES of the new Sulzer refrigerating compressor

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No piston rings
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No oil in gas being compressed
No packing wear—labyrinth type gland
No leaks—totally enclosed frame
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Trouble free running
Low maintenance costs
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CAPACITIES 400,000-4,000,000 BTU/hr. for system temperatures down to — 160° F

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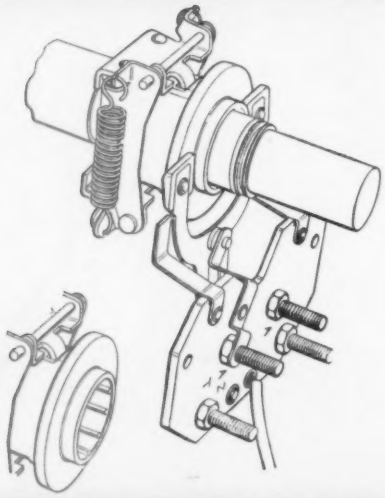

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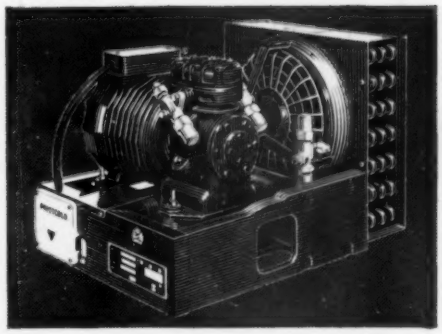

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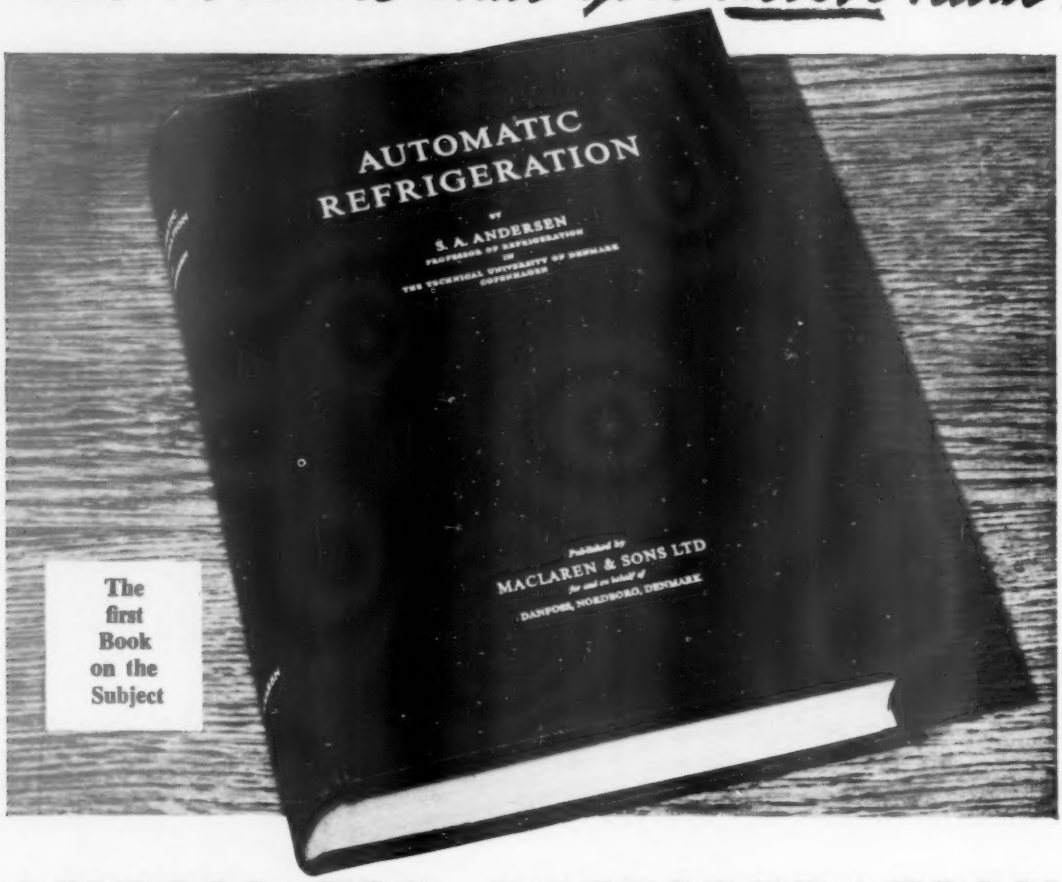

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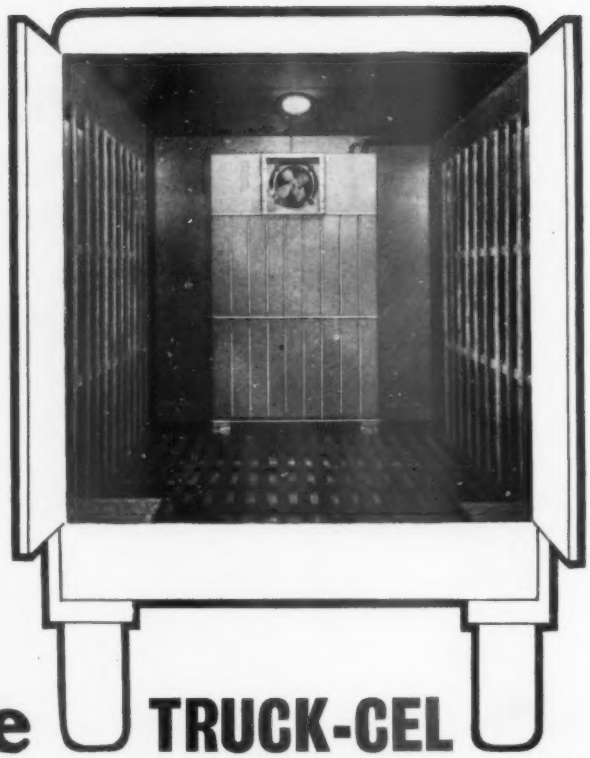

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SEPTEMBER · 1961

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Editorial...

Brake on Initiative

The Missile Era

More Beer

● The domestic refrigerator industry's insistence that this growing trade is being held back by Government policy was further illustrated by the June returns. Deliveries to the home market of British-made domestic refrigerators totalled 117,805 in that month. Even so, this is a decrease of 7 per cent. compared with June 1960. Total deliveries to the home market for the first six months of this year were 534,547. This is a decrease of 18.2 per cent. compared with January to June 1960. The downward trend in exports, due to the uncertainties of the home market, continued in June. Deliveries sent overseas were 12,626, a decrease of 14.5 per cent. compared with June 1960. The total export deliveries for the first six months of the year were 75,741, a decrease of 1.4 per cent. on the same period of 1960.

● Perhaps one of the brighter sides of guided weapon development, from the man-in-the-street's viewpoint, has been the fact that it has provided the impetus for advances in many branches of engineering. Among the most outstanding achievements have been those in the field of instrument engineering for missile guidance and control. These developments are finding application not only in stabilization and guidance in the air and at sea but also in many problems of industry.

● Aeronautical subjects comprise the hard core of this month's issue coinciding as it does with the annual flying display and exhibition, the 22nd, of the Society of British Aircraft Constructors at Farnborough.

● English Electric Aviation, whose premises at Stevenage are the subject of an article in this issue, included development and manufacture of instruments as part of its plan for setting up facilities for advanced guided weapons production. Subsequent experience showed the need for a more extensive installation, capable not only of engineering components for existing missile projects but also of designing systems for application of the new techniques in other fields. The instrument wing has been conceived as a comprehensive unit for this purpose and the facilities provided are believed to be the finest of their kind in Europe.

● MODERN REFRIGERATION's angle on this factory producing gyroscopes is, of course, that of air control, for absolute cleanliness is vital to the process. Only staff actually working in the instrument wing are normally allowed inside. They have to go through changing rooms to don special smocks and caps. In the super-clean areas where final assembly is done, the staff make a further change into spotless overall suits and anti-static boots. The annual laundry bill for this special clothing is £700. In addition to all these precautions, the actual instrument assembly is done under special cabinets where super-clean air is continually pumped over the assemblers' hands to prevent invisible dust particles from settling on the work.

● The United States Government seems determined in its efforts to "sell" American foods to the British housewife. Through its new shop-window at 57 St. James's Street, London, S.W.1, it is currently staging a food fair (Sept. 5th to 22nd), included in which are several new-to-Britain frozen foods. More than 3,000 different products are on view. "Still to come" state the organizers "are the foods processed by freeze-drying, a combination of both processes to give the best of two worlds and to make up into lightweight packs of food which can be stored without refrigeration; shipped across the world at little cost because they are not heavy; carried up mountains with expeditions; taken into the curious places where armed forces and serving men have to go. Britain and America are both working on freeze-dried foods . . . yet another market for the two nations to share."

● Breweries have been much in the news in recent years, mainly in connection with take-over bids. A new brewery is, however, something of a rarity. A fast construction schedule is being maintained at Alton, where John Laing Construction, Limited, are constructing a new brewery for Arthur Guinness, Son & Co. (Park Royal) Ltd., and Courage, Barclay & Simonds Ltd., in conjunction with Mitchells & Butlers Ltd. A six acre site is being developed, and on completion early in 1963, the brewery will consist of six main sections, covering some 116,000 sq. ft. These sections include a two-storey grain handling building, a five-storey silo building, a four-storey office and laboratory block, a three-storey brewhouse, a single-storey refrigeration plant and a five-storey fermentation and storage block.

● Already described in these columns, the revolutionary Associated Fisheries trawler the *Lord Nelson* has returned to Grimsby with her first catch and she had on board approximately 200 tons of whole fish which had been frozen at sea into 92 lb. blocks, 42 in. long, 22 in. wide and 4 in. thick. Radyne electronic fish thawing plant has been specially built to work in conjunction with the *Lord Nelson* and was on "acceptance trials" at Wokingham in August; for the purpose of these trials a part of the *Lord Nelson's* frozen catch had been sent to Wokingham.

● The pea quick-freezers have had a bumper season this summer, described, in fact, as "one of the best for 10 years." At Birds Eye's factories at Grimsby, Yarmouth, Lowestoft and Kirkby, production of quick-frozen peas this year was even higher than last year's record. In six or seven exhausting weeks between late June and early August, all four factories worked 22 hours a day seven days a week to get the crop harvested and frozen in the shortest possible time. This planned increase by the company, which claims two-thirds of the British frozen food market, and every year undertakes the biggest pea freezing operation in Europe, is linked with market forecasts indicating that industry turnover will reach at least £57,000,000 by the end of 1961. Turnover in 1960 reached £46,000,000.

● The 1961 congress of the German Association of Refrigeration (D.K.V.) will be held in Vienna from Wednesday, 11, to Saturday, October 14. The papers meetings will be held mainly in the Vienna Concert House and in the conference room of the Market Hall. Papers meetings on Thursday and Friday include: Presidential Address by Prof. Dr. Heinrich: "Wither the modern world?"

Prof. Dr. Eder: Actual problems of low temperature technique.

Dr. Ing. Stephan: Dimensionless characteristics of heat pickup of evaporating refrigerants.

Dr. Ing. Kessler: Heat and material exchange of porous goods in freeze-drying.

Dr. Haenlein: Technical possibilities of Peltier Effect.

Councillor Dipl. Ing. Swaty: Operating experiences with compression and absorption heat pumps.

Dipl. Ing. Arnold: High pressure air-conditioning in office buildings.

Prof. Linke: Ventilation with air-conditioning from top to bottom or around?

Prof. Dr. Ledinegg: Heating and refrigeration research for rail coaches in Vienna.

Chief Eng. Dr. Hirschberg: Freezing methods.

Dipl. Ing. Knapp: Modern cooling and freezing room layout.

Dr. Lagonie: Freezing and storage of cheese.

Miss Sauerbrunn: Refrigerant problems.

Dr. Ing. Dienemann: Indicating a small refrigerating compressor.

Dr. Ing. Berliner: New methods of calculation of cooling towers .

Prof. Niebergall: One and two stage absorption machines.

Technical visits include an early morning visit to a bakery, the new works of Austrian Brown Boveri, the Seibersdorf atomic reactor, a research station, the technical equipment of the state opera house, and a heat pump plant. The ladies programme includes a porcelain factory, an extensive tour of the city and its castles, and tea in olde tyme setting. Those wishing to attend should make arrangements with Kongressburo Cosmos, Kaernter Ring 15, Wien 1, Austria.

BREWERY REFRIGERATION

TWO new refrigeration compressors have now been installed at the Guinness Park Royal Brewery. They are the first phase in a programme to modernize completely the brewery refrigeration plant. When this programme is completed, the refrigeration capacity will be more than double that of the original installation.

The new plant consists of two ammonia compressors each capable of extracting 3 million B.t.u. per hour and reducing chilled water to a temperature of 38°F. These compressors are driven by 300 h.p. motors of 3,300 volts, connected "straight" onto the electrical ring-main system of the brewery. The operation is completely automatic, the machines being self-regulating, stopping and starting according to the demand of refrigeration.

The installation of this plant has necessitated the building of an additional sub-station to cope with the increase in electricity demand. The main contractors for the refrigerating plant were J. & E. Hall, Ltd., while the electrical control panel for the ammonia machines was supplied by Watford Electric and Manufacturing Company Limited. The electrical installation of the sub-station was carried out in conjunction with McLellan and Partners, consultants, the switchgear supplied by Switchgear & Cowan Ltd., and the transformer supplied by Ferranti Ltd.

"FROZEN FOOD CITY"

TRANS-AMERICAN Refrigerated Services Ltd., a national network of independent refrigerated warehouse companies, announces that one of its members, Merchants Refrigerating Co., of New York City, recently opened its new "Frozen Food City" in Secaucus, New Jersey.

Frozen Food City, an ultra-modern processing, warehousing, and distribution centre, began operations for its customers during the latter half of June.

Frozen food products started rolling by truck and rail in mid-May into the huge freezer storage rooms from which orders are made up for distribution throughout the New York metropolitan area.

The centre has 3,100,000 c.ft. of warehouse space all on one level, spacious parking and manoeuvring area, and adjacent acreage available for processors' plants. The first frozen food processor to locate at Frozen Food City is the Chock Full O'Nuts Corp., whose new plant is now under construction.

"Frozen Food City" the announcement said, "has been designed to utilize the latest equipment, both mechanical and technological, in its efficient transfer of products, kept under controlled temperature at all times. A 1,400-ft. towline system has been installed by Mechanical Handling Systems, Inc., providing fully automated transfer of product from truck and rail docks to predetermined stations within the warehouse.

NEWS OF THE MONTH

Refrigeration and A-c Exports.—During July, 1961, air-conditioning and refrigerating machinery and fans (commercial and industrial sizes) to the value of £765,048 weighing 1,044 tons was exported from the United Kingdom. Comparable figures for July, 1960, were 946 tons, worth £721,052.

* * *

Exports' Analysis.—Of the 1,044 tons of air-conditioning and refrigerating plant worth £765,048 exported by Great Britain in July—quoted in the preceding paragraph—36 tons went to the Union of South Africa, 42 tons to India, 14 tons to Australia, 33 tons to New Zealand, 41 tons to Canada, 201 tons to "other Commonwealth countries, 98 tons to Eire, 16 tons to Sweden, 34 tons to Western Germany, 64 tons to the Netherlands, 51 tons to Belgium, 19 tons to France, 14 tons to Italy and 381 tons to "other foreign countries."

* * *

Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigeration machinery during July, commercial refrigerating machinery accounted for 100 tons worth £68,679, industrial plant and equipment for 197 tons worth £128,673, and refrigerating machinery, equipment and parts for 458 tons worth £336,175.

* * *

Exports of Small Refrigerators.—During July, 1961, 876 tons of complete refrigerators and domestic refrigeration equipment were sent overseas from Great Britain. These exports were worth £555,645. The 876 tons comprised 13 tons to the Union of South Africa, 4 tons to Rhodesia and Nyasaland, 28 tons to New Zealand, 26 tons to Canada, 346 to "other Commonwealth countries and Eire," 43 tons to Sweden, 39 tons to Western Germany, 11 tons to Italy and 366 tons to "other foreign countries."

* * *

Ice Cream Box.—It would seem that a solution has been found to the housewife's difficulties in transporting ice cream and frozen foods to her home. Even the coldest shopping day in winter does not keep ice cream firm enough on its way home from the store, not to mention the difficulties of buying ice cream on a hot summer's day. Wall's solution to this problem of melting ice cream

is their new KeepKold box. It is a feather-weight container made of expanded polystyrene. Measuring 3 in. deep, 6¾ in. long and 4¾ in wide, it will keep a Wall's family brick in good condition for up to four hours. And for those who wish to leave the box in the shop to be picked up later, there is a label on it for writing the owner's name. The KeepKold box retails at 1s. 6d.

* * *

New Cold Store.—A new ice factory and cold store manufacturing unit is proposed for Pittenweem, Fife. The cost will be approximately £50,000 and the sponsor is Mr. David Lawrie, James Street, Pittenweem. The site selected for the plant is at Abbey Wall Road, Pittenweem, for which approval has been currently given by the Planning Committee of Fife County Council. The East of Fife was once a major fishing area with fleets from all the ports including Pittenweem. In recent years the fishing has declined but there is still a substantial interest in the area in food production and in sea food activity and the new unit is designed to meet this interest, supplying ice to the fishing fleet and holding in store landings which are not cleared within the same day's trade.

* * *

Soft Fruit Tests.—The Horticultural Marketing Council's experiment on pre-cooling of soft fruit from Scotland for delivery to the London and Brighton markets has been concluded. Some 13 tons of raspberries went to these markets, starting on July 17 and continuing at intervals using pre-cooling and refrigerated road and rail transport. The London deliveries averaged between 2s. 6d. and 3s. 6d. per lb., while the Brighton consignments did better at 4s. per lb. The economics of the operation will now be assessed and any profits returned to the growers who receive a market price for their berries which were then sold by the council. The experiment has proved conclusively that pre-cooling and refrigerated transport are practical routines opening up extended scope in the south for Scottish soft fruit. The future exploitation of the results of the experiment now await decisions from the growers who will consider 1962 policy in the light of this year's experiment.

* * *

Dairy Engineering Show. — The Dairy Engineering Exhibition, sponsored by the Dairy Engineers' Association, will be held in the National Hall, Olympia, London, from January 28 to February 1, 1963. It will be the only engineering exhibition in the United Kingdom devoted wholly to a comprehensive display of modern equipment for the treatment of liquid milk and the manufacture of milk products. Exhibits will include, machinery, equipment and ancillaries for the reception, storage, pasteurization, sterilization, bottling and storage of liquid milk and cream; the production and packaging of cheese, butter, condensed milk and powdered milk and the production and packaging of ice cream. The Dairy Engineering Exhibition will be a trade show of outstanding interest to all persons concerned with the dairy industry in any of its branches, or with the equipment it uses. Officials of government departments, educational and dairy research establishments, and students will also be welcome. Full information may be

obtained from the organisers—The Trades' Markets & Exhibitions Ltd., 623/4, Grand Buildings, Trafalgar Square, W.C.2.

* * *

Greek Refrigerator Ship—The first Greek refrigerator ship, the *Neorion*, built in the Rethymnis shipyard at Syros Island, has sailed for Piraeus and Thessaloniki to load a shipment of peaches. The *Neorion* has two refrigerated compartments of a total capacity of 11,000 c.ft., and is equipped with refrigeration machinery capable of maintaining a temperature of 20° C. below zero. The vessel, which cost £100,000, belongs to the Trans-Fruit Company. The *Neorion* will be used to transport fresh fruit from Greece to Red Sea ports.

AIR - CONDITIONING TEXTILE MILL IN KHARTOUM

A consortium of three British firms, the English Electric Company Limited (electrical manufacturers), Platt Bros. (Sales) Limited (manufacturers of textile machinery) and Marples, Ridgway and Partners Limited (civil engineering contractors) was formed in 1959 to supply a complete textile mill worth about £6,000,000 at Khartoum, Republic of Sudan, to Mr. John Theodoracopoulos of Sudan American Textile Industry John Theodoracopoulos Company Limited.

The output of the mill will be 75,000,000 yards of cloth per year.

Khartoum is hot and dry, with the mid-day temperature above 100° F. for six months of the year. Extensive air-conditioning was, therefore, needed to create a cooler and more humid atmosphere within the workrooms. There are no windows in the workrooms, and strong illumination is provided by fluorescent lamps.

The air-conditioning system circulates 1,150,000 c.ft. of air per minute throughout the mill. Fresh air is drawn in generally above roof level, and filtered, cooled and humidified in spray chambers below the production floor. It is then blown through main ducts running above the ceiling, and distributed to slotted secondary ducts running across the building.

* * *

Educational Courses in Norwich.—The East Anglia Refrigeration Association have arranged with the Engineering Department of the Norwich City College and Art School to provide educational courses based on the City and Guilds of London Institute No. 72 syllabus, "Refrigeration Practice." Employers are being contacted with the object of part-time day release, and an evening course is being organized. For the latter, individuals must be prepared to devote three evenings per week of their spare time, and enrolments must be sufficient to ensure an attendance of 16 students. The refrigeration industry and others are invited to assist with this venture by donating any surplus refrigeration components and parts or accessories to the College. Courses for part-time day release are being discussed with local employers.

* * *

New Beama Board.—The BEAMA council has established an electronics board to represent that part of the BEAMA membership directly concerned with electronic engineering. This new board will act for the council on matters of broad policy in this field and it will provide the necessary high-level liaison with Government departments and other associations on policy matters affecting the electronic industry. Mr. Leon Bagrit (Elliott Bros.) is chairman of the new board.

Picture of the Month

This ammonia compressor, one of two recently installed at the Guinness Park Royal Brewery, is capable of extracting 3 million B.t.u. per hour and reducing chilled water to a temperature of 38°F. **(Further details on page 913.)**

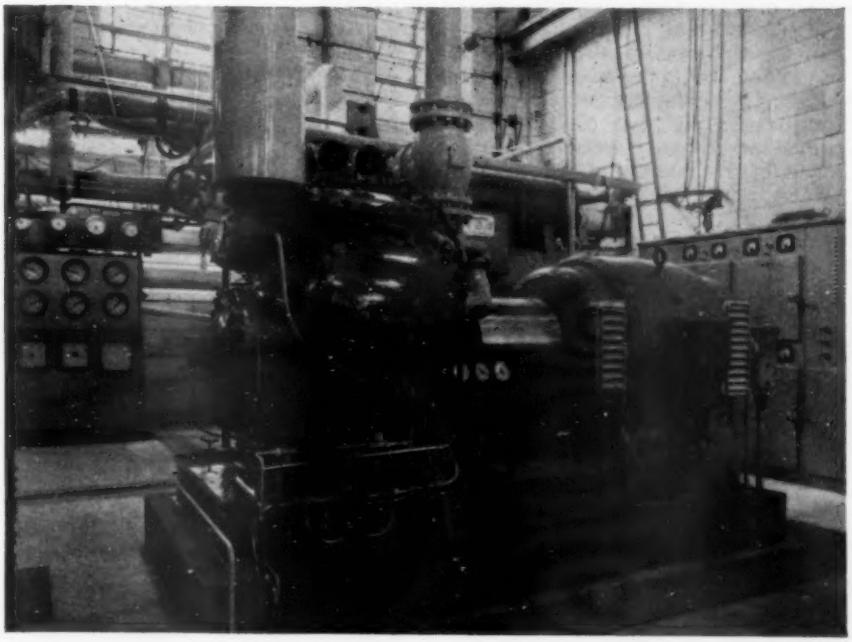


Fig. 1.

Air-Conditioning Specialized Industrial Test Rooms

THE steady rise in the standard of living in Britain and the consequent demand for domestic electrical appliances has led to considerable expansion in this section of industry. This has been given further impetus and urgency by the economic need to export goods to maintain our balance of trade.

To meet competition and assure a market for our goods in the light of present-day trends, considerable attention has been given both to the outward design to make the product attractive and easy to use and also to the technical design to ensure, by close specification, good performance in all parts of the world in climatic conditions more severe than are found in this country. These conditions involve both high temperatures up to 110°F. and high humidities almost up to saturation point.

The outward results of this steady but intensive development and improvement can be seen in the generally pleasant and functionally smooth and efficient designs which are easy to use and to clean.

Nevertheless, the most important factors are not apparent. These are the time, thought, energy and money put into the design and development of component parts to ensure that they will function faultlessly after prolonged use under adverse conditions.

The intensity of this effort can be inferred from a reading of the numerous British Standards relating to domestic appliances and in particular to the testing of electrical components and systems, on the reliability and suitability of which, the whole product depends.

The achievement of this high standard has involved the expenditure of large sums both on plant and tools to achieve large volume production and on research and test facilities to assure the achievement and maintenance of the desired standards of quality.

To enable full scale type tests and production sampling tests to be carried out repeatedly, as well

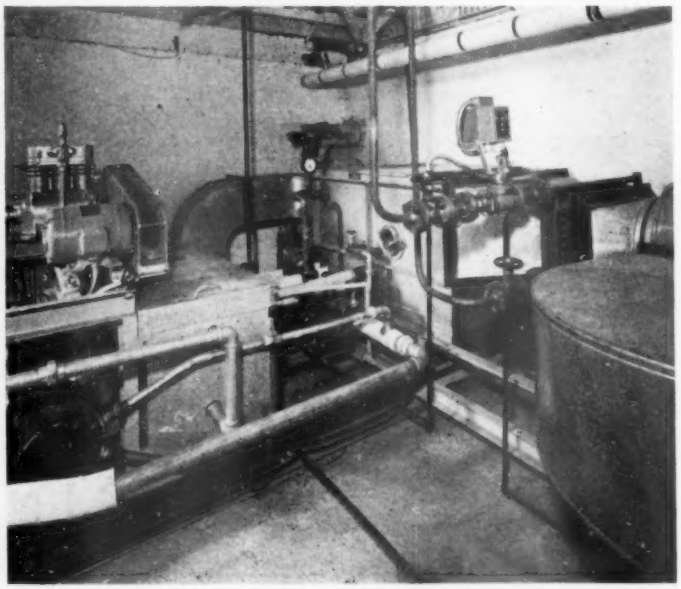


Fig. 2.

Fig. 3.

as for further research and development, it is virtually essential to have a suitable full size test room in which the atmospheric conditions can be closely and continuously controlled and where testing staff can make close inspection under working conditions. This is not possible with small test chambers adequate only for testing small components. A room of about 1,500 c.ft. meets most requirements.

In the case of domestic refrigerators, British Standards lay down tests under climatic conditions varying between 60°F. and 110°F. dry bulb temperature and 75 per cent. relative humidity, and for certain domestic electric cooker components 95 per cent. relative humidity maintained closely for 48 hours. These latter tests are concerned with safe clearances between live electrical components to prevent leakage and tracking in damp conditions and are covered by dielectric and insulation resistance tests.

Domestic refrigerators, in addition to tests to prove temperature performance in specified maximum conditions, must resist "sweating" on the outside in high humidity conditions and this can only be proved in a controlled atmosphere.

Such a test room of brick construction with insulated and lined walls and ceiling has been constructed by Simplex Electric Co. Ltd., at their Blythe Bridge factory with special air-conditioning equipment designed, manufactured and installed by Carter Thermal Engineering Ltd., of Birmingham.

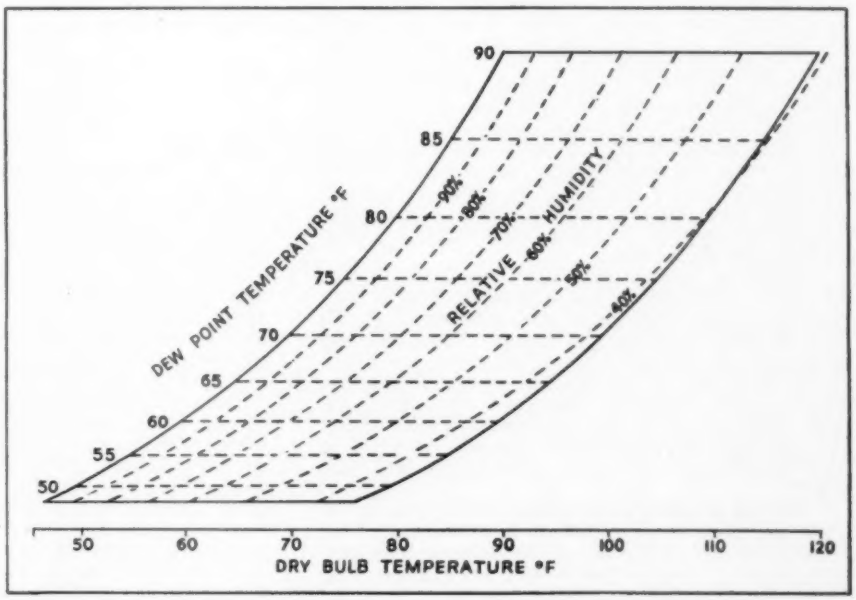


Fig. 4.—Designed limits of operation.

A number of designs of plant are available but to obtain the best results and rapidity of response to give close control over lengthy periods a washer type plant was selected. This operates on a pre-set dew point basis with heating and cooling facilities to the water sprays.

A tempering heater battery is used to achieve the required dry bulb temperature, the heat coming from the factory high pressure hot water system and regulated by a motorized valve actuated, as is the whole plant, by means of the latest electronic control methods to give close, accurate control.

In order to cater for different test conditions that may be required, the dew point and the dry bulb temperature controls are arranged to be individually preset to any selected condition within the limits designed for the plant. The controls take the form of rheostats in the electronic system, the dials being calibrated in °F.

This system provides control limits of ±2°F. dry bulb temperature over a range of 60°F. to 90°F. and ±2 per cent. relative humidity over a range from 35 per cent. relative humidity to almost 100 per cent. relative humidity. The plant can easily be arranged to give 110°F. dry bulb conditions when required by operation of a control switch which cuts out the humidification process.

The plant is mounted on top of the test chamber as shown in fig. 1, photographed during construction. Air is drawn through the washer where it is automatically adjusted to the dew point condition by a series of water sprays. The air then passes through the heater battery (fig. 2) where the dry bulb temperature is adjusted to the value required to give the desired condition, and on through a low speed centrifugal fan into the delivery duct whence it is delivered to the test room via a distribution trunking with full-length grille (fig. 3).

Air is withdrawn on the opposite side of the room and returns to the washer. To maintain air freshness and compensate for leakage loses from the room, sufficient fresh air, filtered down to 5 microns, is drawn into the system through a dry fabric type filter. The filter (top centre, rear fig. 1) is fitted with a differential pressure gauge to indicate when renewal is necessary.

To achieve close control with rapidly changing external conditions, it was essential to obtain the quickest possible response in the plant. This was done by speedy replacement of the water in circulation to the sprays by heated water derived from the high pressure hot water factory supply or, alternatively, by feeding in chilled water from a system maintained at a suitable temperature by means of a Carter packaged liquid chilling plant (top left, fig. 1).

Both hot and cold water are fed to an electronically controlled motorized three-way mixing valve, which mixes the two in the correct proportions required at any particular time to maintain the pre-set condition.

The designed limits of operation for this plant are shown graphically in fig. 4 and it will be seen how diverse are the room conditions within its capability. The design is readily adaptable to meet most other conditions that can be envisaged.

THE AMERICAN SHOP WINDOW IN BRITAIN

AS a prelude to the opening of the American Food Exhibition (Sept. 5 to 22) at the U.S. Trade Centre, 57, St. James's Street, London, S.W.1, Mr. Robert N. Anderson, agricultural attaché, American Embassy, London, recently told the Press : " You may not realize that traditionally the United States has been Great Britain's principal foreign supplier of agricultural products. Also, that Britain is the largest export market for U.S. agricultural commodities. Last year food and agricultural imports from the United States had a value of some £200,000,000 sterling and made up about half of this country's total imports from America. Total trade between our two countries is larger than that of any other two countries in the world.

" Expanding overseas outlets are important to U.S. agriculture, which exports about 16 per cent. of its total production. The percentage is higher for some items. We normally export a third of our soybeans, tobacco, and lard; 40 per cent. of our cotton, wheat, and tallow ; over half of our rice ; and a large quantity of our feed grains, poultry, dairy products, fruits and vegetables, and other products. Total U.S. agricultural exports, fruits and vegetables, and other products last year amounted to $4,800,000,000 and made up a fourth of the total U.S. exports.

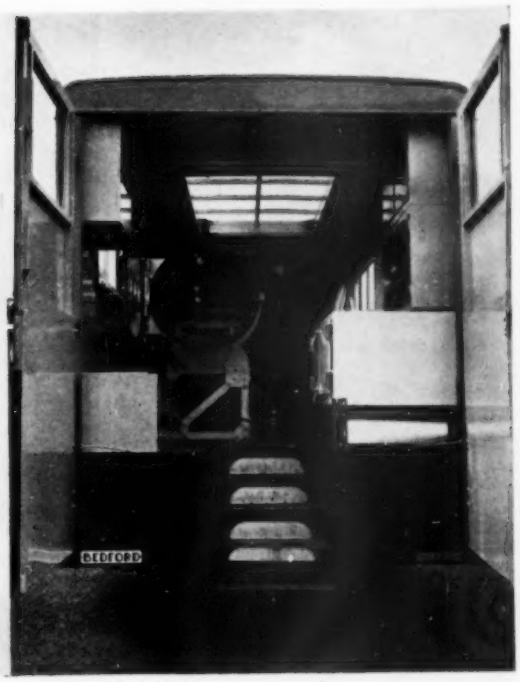
" The bulk of the U.S. agricultural items coming to the United Kingdom are raw products which are needed for the industries here and which do not compete with local farm output. These include cotton, tobacco and corn maize. The United States normally supplies about 40 per cent. of the raw cotton and 50 per cent. of the leaf tobacco used in Great Britain and about 40 per cent. of the U.K. feed grain imports.

" For a number of years after the war a great many U.S. food products could not be imported because of the United Kingdom's dollar shortage. Now, happily, most of the restrictions are lifted, and we hope to develop sales of a wide variety of processed, canned, frozen, and packaged foods.

" An expanding export market is essential for U.S. agriculture, but it is also to the advantage of U.K. consumers and to the British industry and trade. Consumers benefit by an assured and ample supply of food and agricultural products at reasonable and fair prices. They receive a wider variety and better choice. Industry and trade benefit by the greater volume of business and the stimulation and development of business through competition. We welcome competition since we realize that through this production and distribution are made more efficient.

" Since the war there has been a rapid development in America of production and consumption of processed, canned, frozen, and packaged foods. More and more of these convenience foods of all kinds are being demanded by the housewives. In this busy age, housewives have less help in the kitchen and more demand on their time for other activities than cooking and cleaning in the home. Our food technology and new processes have helped to make food preparation in the home much easier and have provided a richer, healthier and more varied diet than any time in the history of the world."

Freeze-Drying being widely demonstrated to Food Factories



Believed to be the only mobile freeze-drier in the world.

LAST month Mitchell Engineering Ltd. demonstrated to the Press their mobile freeze-dryer, believed to be the only one of its kind in the world, which is the outcome of 10 years of research in this field.

The Mitchell process involves freezing the material, then removing its water content by "sublimation" under vacuum while the material remains frozen solid. A refrigerated vapour condenser or steam ejector removes the water vapour from the freeze-drying system. Because the whole process is carried out at a low temperature the substance being treated loses nothing but its water molecules. This is vitally important for medical and biological applications. In fact, freeze drying was originally developed during World War II for preserving blood plasma and other biological materials, such as vaccines, without loss of their essential qualities.

A freeze-dried product is reconstituted simply by the addition of water, when it almost immediately regains its original colour, shape and texture. In the case of foods, taste is scarcely affected. Freeze-dried materials are also extremely light, will keep almost indefinitely if packaged in moisture and oxygen-proof containers and can be stored at normal temperatures.

Mitchells' work on freeze-drying—in collaboration with Dr. R. I. N. Greaves, of Cambridge University (whose paper before The Institute of Refrigeration will be recalled) was highlighted three years ago when the firm installed Britain's first large-capacity freeze-drying plant for a Hertfordshire company. The plant is now at work producing coffee powder.

Among the many different foodstuffs which have been successfully freeze-dried and which are capable of freeze drying on an industrial scale are mushrooms, potato chips, fish, cabbage, brussels sprouts, chicken, soups, meats, spinach, green beans, carrots, fruit and fruit juices, peas and milk.

Mitchell Engineering Ltd. now offer food manufacturers freeze-drying plant of up-to-date design and large capacity, and it is in this connection that the firm has produced its unique mobile unit which is fitted with J. and E. Hall's refrigeration plant.

The unit is designed for giving on-the-spot demonstrations at factories where canning or other conventional food processing is going on. At such demonstrations sample quantities of foods are taken from batches which are to be conventionally processed and are freeze dried in the Mitchell unit. They are then reconstituted so that the manufacturer can get some idea of how freeze-dried foods compare with his own.

The advantage of such demonstrations is in the exact comparison which can be made between freeze-dried and conventionally processed foods owing to the freeze-dried samples being taken from batches being used for routine production and being processed at the same time.

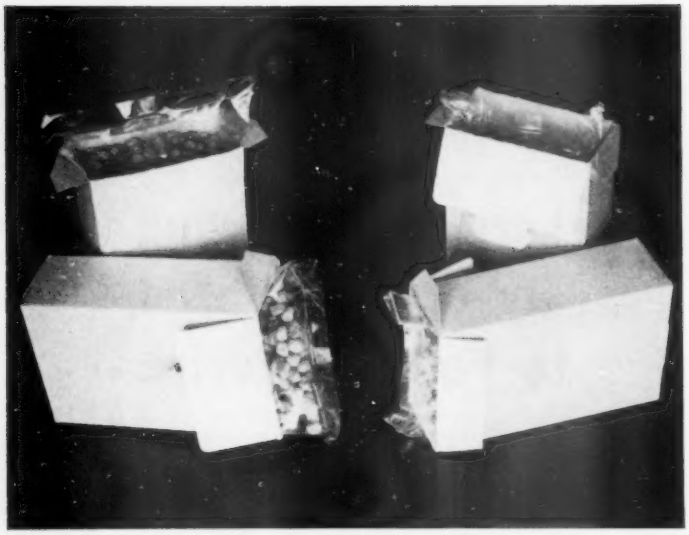
Demonstrated at the same time was the new Cekatainer being manufactured under licence from Sweden by Taylowe Ltd., of Maidenhead.

Founded in 1936 by the managing director, Mr. F. H. Lowe, 1961 represents the silver anniversary of Taylowe Ltd. During these years Taylowe have built up an enviable reputation for lithographic printing, particularly in the quality carton field supplying many of the country's famous manufacturers. Taylowe also have special reputation in four-colour offset, book covers, general paper printing, and run the remarkable five-colour Marinoni Press.

Ever aware of the need to keep abreast and ahead of modern marketing, particularly with growing consumer demands for absolutely fresh products, Taylowe have widened their activities in the packaging field by acquiring the exclusive licence in the United Kingdom and Eire for the manufacture and marketing of Cekatainer.

Taylowe research has produced the developments which make it possible to offer Cekatainer cartons, automatically packed, for such diverse products as coffee, frozen foods, confectionery, cake mixes, biscuits, cereals, vinegar, motor oil, margarine and butter, citrus fruits, milk powder, slimming products, dried fruit and beverages.

A necessary proof of the unique system such as Cekatainer is that it should be capable of meeting any



Freeze-dried peas in Cekatainer.

potential need. With this in mind Taylowe have produced the first effective packaging system for freeze-dried products.

There are four basic requirements for packing freeze-dried products :—

(1) Freeze-dried products must be protected from light.

(2) Because they are extremely dry they are very hygroscopic, needing extra protection from moisture vapour.

(3) They are mostly susceptible to oxygen reaction and need to be kept in an oxygen content of 2 per cent. or below.

(4) These brittle products must not suffer mechanical damage.

The Cekatainer system answers these requirements in the following ways :—

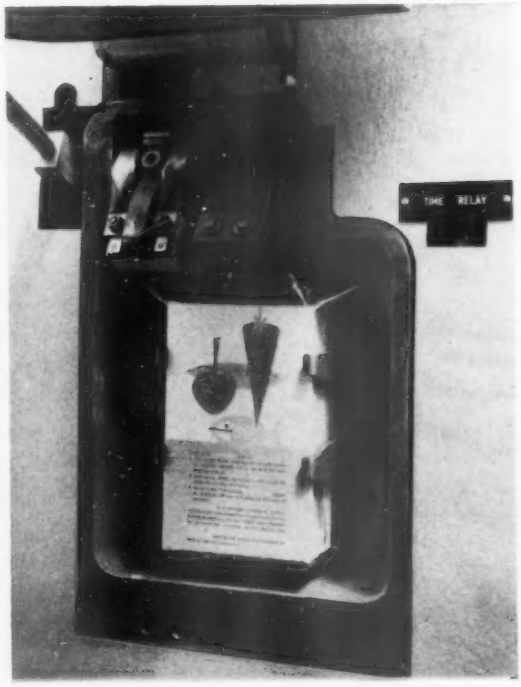
(1) For light protection the printed outer carton and the inner liner are complete in themselves for excluding light.

(2) For moisture protection suitable barriers are incorporated in the lining material.

(3) For oxygen protection suitable barriers are again built into the material. The pack after processing by the Cekatainer machinery, is filled or partially filled with inert gas considerably improving the oxygen barrier and permitting a shelf life of up to two years.

(4) To protect against mechanical damage effective use is made of a Cekatainer patent. The Cekatainer liner is attached to the inside carton wall by glue spots which can be arranged to a required pattern. When AFD products are packed all air is evacuated and subsequently filled with inert gas to a pressure below that of atmosphere. The effect of partial vacuum causes a loss of adhesion at certain spot glued points between the liner and carton thus a partial collapse of the liner. This means that the product is held firmly within the bag and the bag is held firmly by the carton.

Taylowe have had tremendous help from food packers and processors in carrying out proper packing tests on their products. There is, however, a vast difference between moving a product over some hours after manufacture and packing immediately. To help potential users make a true assessment, Taylowe's accepted the necessity of producing a mobile packaging laboratory. The demand for such a facility was increased by the coming of A.F.D. foods particularly the enlightened and courageous effort by Mitchell Engineering Ltd. with their mobile freeze drier.



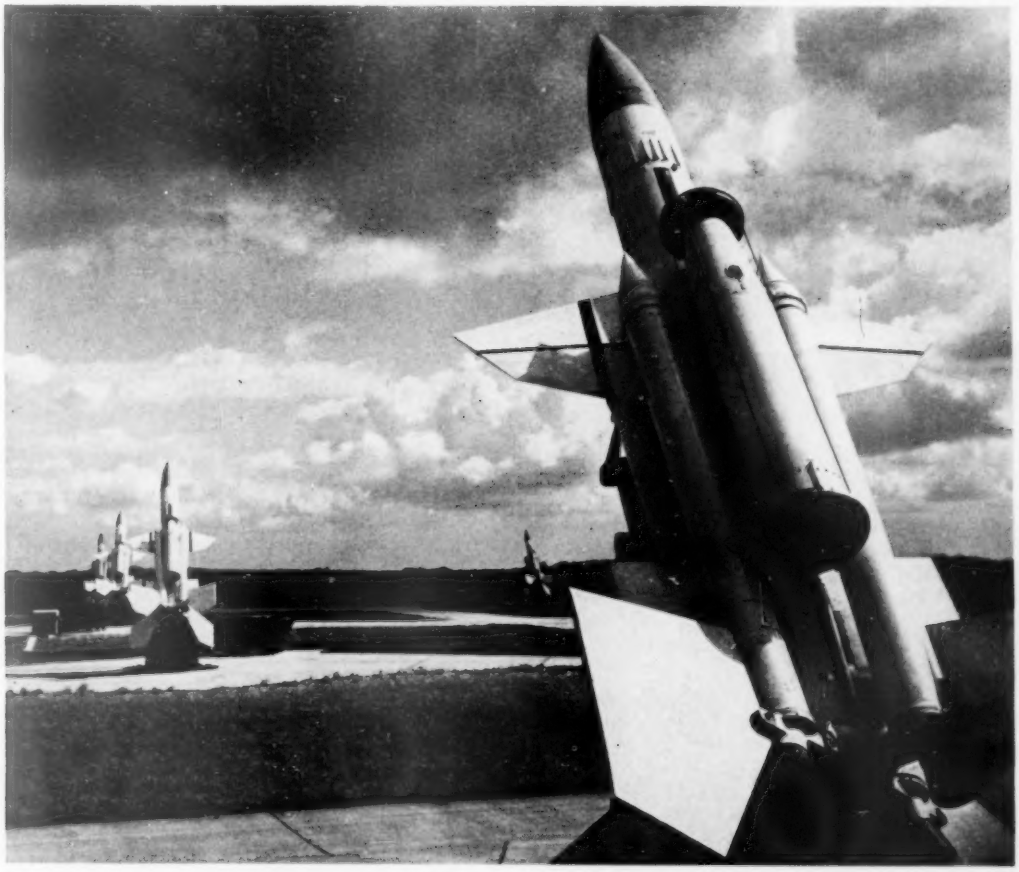
Vacuumizing chamber on board Taylowe's mobile packaging laboratory.

Progress in Aeronautics

REVIEW OF AIR-CONDITIONING'S AID in relation to

1 Production of Precision Instruments for Missiles
2 Human Comfort Aloft

This supplement is published to coincide with The Society of British Aircraft Constructors' 22nd flying display and exhibition at the Royal Aircraft Establishment, Farnborough, which this year was on a larger scale than ever before. The many spectacular displays seen over this Hampshire aviation centre were made possible by (a) the skill and daring of the pilots and by (b) the superlative quality of the aircraft. The contribution of the air-conditioning and refrigeration industries to these achievements is by no means a small one.



This photograph of Bristol/Ferranti Bloodhound missiles in readiness on their launchers at R.A.F. Station, Woolfox Lodge, typifies aeronautical progress which, from the air-conditioning aspect, is dealt with in the following nine pages of this issue.

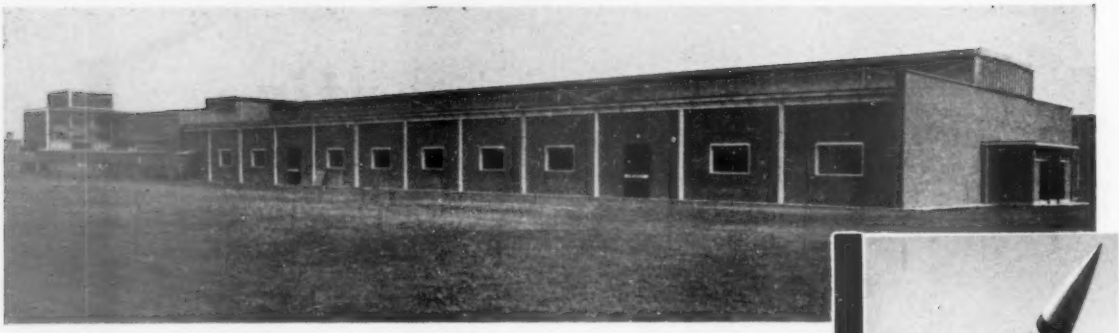


Fig. 1.—Assembly building.

Air-Conditioning *for Assembly of Airborne Instruments*

English Electric Aviation Ltd's Thunderbird in service with Royal Artillery.

Assembly operation, instrument wing.

IN this article are described the buildings of the Instrument Wing of English Electric Aviation Limited, one of the associated companies of British Aircraft Corporation Limited. The wing was set up by E.E.A. as part of the plan to build comprehensive facilities for the manufacture of complete guided weapons systems. At first, the wing developed and produced relatively simple and large displacement and rate gyroscopes for Thunderbird, the British Army's ground-to-air missile. Later, when development of the Blue Water missile for the Army was ordered, it was necessary to take out a licence with the Minneapolis-Honeywell company of the U.S.A. for the manufacture and development of their 7-oz. miniature integrating gyroscope (the MIG). It has now been in production at Stevenage for two years and is the only miniature inertial quality gyroscope being made in Europe.

The starting of work on the MIGs coincided with the decision to expand the instrument wing into a factory with the most advanced and comprehensive facilities for this type of work in Europe. To do this the new factory had to be built, equipped with highly specialized equipment and staffed with expert technicians. The work now going on there is being done to new and very high standards, and production test equipment consists of measuring machines which are normally used only in standards rooms. Dust is excluded from the assembly rooms by filtering the clean country air of Stevenage as it enters the building. Dust particles larger than 0.1 microns—one-ten-thousandth of a millimetre—are removed. The temperature of these rooms is kept at a comfortable and pleasant 72°F. and humidity at between 35 and 45 per cent.

This £1,000,000 factory at Stevenage, Hertfordshire, is thus much cleaner than a hospital operating theatre.

The choice of contractor to provide the environmental conditions for this unique installation was, therefore, limited to designer-manufacturers with flexible outlook and wide experience of custom-built plant for "precision" air-conditioning.

The work was entrusted to the specialized air-conditioning division of Air Control Installations Ltd. of Ruislip, Middlesex, who had previously developed designs for the pilot factory on which this instrument wing was based.

The precision needed in the final product in the assembly of which not thousandths of inches but thousandths of microns have to be considered, necessitates the ultimate in dust filtration, the constant in temperature and avoidance of dust adhesion and rust

Fig. 2.—Plant room and bridge connecting with assembly building.

necessitate strict control of humidity. Dust particles as small as a hundred thousand to the inch may be fatal in some of the precision products of this establishment.

The wide range of filters manufactured by Air Control Installations Ltd. enabled the ideal selections to be made first for roughing filters normally ample for the average requirement; film type scrubbers for soluble or wettable dust in the dehumidifier stage, Electro-PL, Electro-Cell, and Rollotron for various stages of cleanliness, and Omicron filters for the final stage of absolute air filtration.

The need to maintain cleanliness of air after filtration required that any surfaces however small between the last filter and the supply outlets were in special materials or finishes. Innumerable finishing

Fig. 4. — Above: Assembly building—interior of bridge.

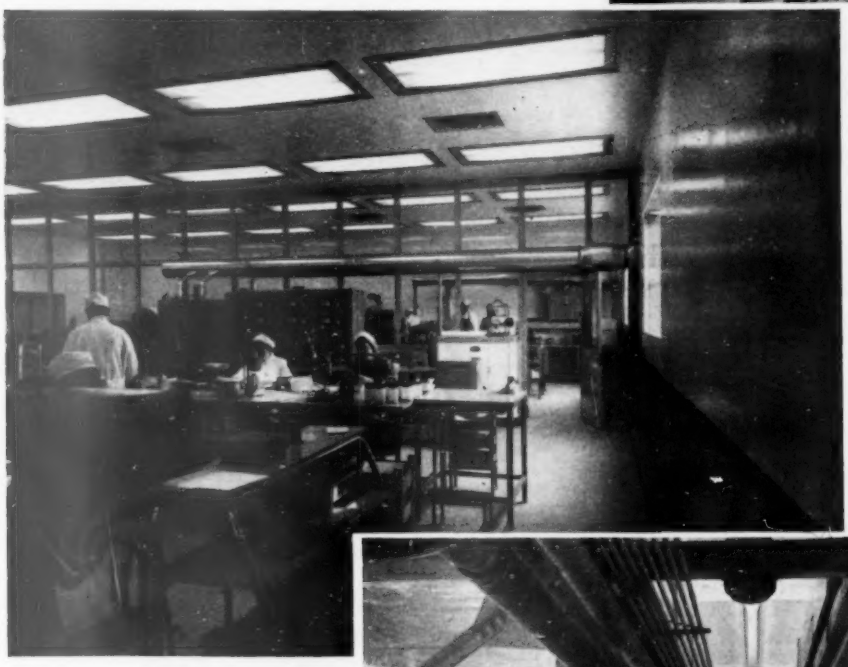


Fig. 3.—Left: A clean air room in the assembly building.

Fig. 5.—Right: The service area (in the roof space) of the assembly building.

Fig. 6. — Air-Conditioning equipment in the first-floor plant room.

coatings were investigated before final selection was made.

Similarly, humidity must not be upset by stray moisture as from tea drinking, for which facilities are provided external to conditioned spaces but nevertheless under strict discipline.

Fig. 1 is a general view of the instrument wing and plant building with a connecting bridge. The dust created by the road work on Stevenage by-pass in the background and the main line railway at the rear combine with other new factories to produce air-conditioning problems in this otherwise rural setting. The water recooling towers serving the refrigeration plant are partly visible on the left. At one time it was suggested that the towers might be constructed as architectural features at either end of the bridge.

Fig. 7.— Refrigeration machinery in the ground-floor plant room.

The very sizeable bridge linking the instrument wing with the plant room is seen in fig. 2. The object is to prevent mechanical vibrations from being transmitted from moving machinery to the instrument wing. The insulated piping carries heating and cooling fluids for the booster heaters and coolers which precede the final air distribution; behind them on both sides are supply and recirculation air ducts. The filters which form the third stage of air filtration (the final for the semi-clean areas) are located near the far end of the bridge, the inside of which is seen in fig. 4.

A general view of one of the rooms is given fig. 3. The ducts are external, in the roof space and the walls and floor respectively, grilles only being visible in the rooms. Supply ducts and lights are serviced from the roof spaces, again to prevent ingress of dust. All occupants, and visitors however momentary, must change into special clothing and head-dress. Windows have been located at suitable heights and spacing to enable visitors to view from outside.

An operator at work is seen in special clothing, on page 922. Perspex screens prevent spoilage of parts by moisture from breath. Superclean air passed over work prevents even sub-micron dust from becoming incorporated in instruments.

The servicing area in the roof space, fig. 5, includes booster heaters and coolers and a labyrinth of insulated piping serving them; on each are modulating automatic controls which are hardly visible and are the only moving solids in this building's air-conditioning plant. The ducting and diffusers are completely covered by continuous plastic coating to prevent any powder being formed. All lights and ducting are serviced from this area to obviate any dust being introduced into the air-conditioned areas. This roof space has non-dust-forming surface finish throughout, acting as the avenue of escape of the discarded air (equivalent to fresh air introduced) and, although only a service area, is as hygienic and dust-free as an operating theatre. The Omicron filters forming the fourth and absolute stage of air filtration precede the final legs of ducting in the case of the superclean area. *concluded on page 938*

Effect of Air Velocity on Aircraft Passenger Comfort

MANY aircraft now in service have air distribution systems that allow each passenger to control a relatively high velocity stream of air delivered to his seat area. The passenger can control a small outlet which may be opened, closed or adjusted to suit individual needs. This outlet also can be swivelled to direct air on the face or other parts of the body. These outlets are referred to as passenger air vents, individual air outlets, " gaspers " or " eyeballs." " They are helpful in that they enable the passenger to obtain a temperature lower than that of the general cabin, aid in smoke clearance while he or people adjacent to him are smoking, and furnish an added fresh air source in relief of air sickness," states Mr. E. J. Overmyer, research engineer with Boeing Airplane Co., writing in *ASHRAE Journal*, U.S.A.

" Design of the individual air outlet system in Boeing 707 jet transport planes was based on the assumption that one-third of the outlets would be open, with a velocity of 1,000 f.p.m. 18 in. away as the objective. This objective essentially was met. We found in practice, however, that there were many times when all of the outlets were open, and at these times the velocity was lower than desired. Studies were conducted to determine means of reducing substantially the pressure drop in the distribution ducting, but any major change involved changing other things in the airplane also, and it was concluded that this was not practicable.

" An alternate method of increasing the discharge velocity was to install a fan in the duct system to boost the air pressure. In our 707s, with vapour cycle refrigeration, there are recirculation fans which provide air flow on the ground. Turbo-compressor or engine bleed air is used in flight. However, in those of our 707s which have air cycle refrigeration there may be extended periods of time on the ground when the air flow is zero or quite low. The procurement and installation of a gasper boost fan would have the added advantage of providing individual outlet air flow under this condition, which the improvements in duct pressure loss alone would not do.

" We knew, of course, that the fan would add heat to the air, and that the more we increased the velocity the greater the fan power requirement, the greater the fan size, and the more heat would be added to the air. We did not know what value of air velocity at the passenger's face would be high enough to satisfy nearly everyone, although we felt that localized air velocities have a different

TABLE I

Condition number	Cabin ambient ° F.	Relative humidity per cent.	Outlet air temperature ° F.	Air velocity at 18 in. f.p.m.	Subjects feeling most comfortable for each set of conditions per cent. of total
1a	85	20	79	365	29
2a	85	20	82	500	17
3a	85	20	87	600	37
4a	85	20	93	700	17
5a	95	15	—	0	8
6a	95	15	88	365	12·5
7a	95	15	95	500	25
8a	95	15	99	600	42
9a	95	15	107	700	12·5
1b	85	20	60	365	30
2b	85	20	65	500	32
3b	85	20	69	600	17
4b	85	20	73	700	21
5b	95	15	—	0	11
6b	95	15	80	365	14
7b	95	15	85	500	21
8b	95	15	90	600	12
9b	95	15	96	700	42
					Number of subjects
1–1	95	57	—	0	1
1–2	95	57	80	365	1
1–3	95	57	85	500	3
1–4	95	57	90	600	0
1–5	95	57	96	700	3
11–6	95	15	—	0	0
11–7	95	15	79	365	2
11–8	95	15	79	500	2
11–9	95	15	79	600	7
11–10	95	15	79	700	4

TABLE II

85° F. CABIN AND 20 PER CENT. R.H.

Air velocity, f.p.m.	365		500		600		700	
Outlet air temperature, ° F.	79	60	82	65	87	69	93	73
Reaction	Number of people responding							
Comfortable	15	45	13	48	18	46	18	46
Warm	9	14	11	11	6	5	5	13
Uncomfortable	0	0	0	0	0	0	0	0
Hot	0	0	0	0	0	0	0	0
Gasper air too hot	0	2	0	1	1	0	0	2
Air just right	22	57	22	51	21	52	19	54
Air too cool	2	0	2	6	2	6	5	3
Air velocity too high	7	12	12	26	15	41	16	43
Velocity just right	14	45	10	31	9	17	7	16
Velocity too low	2	2	2	1	0	0	0	0

effect on comfort than velocity over the entire body. Also, we did not know to what extent the air temperature rise would offset the comfort gain of increased velocity. To answer these questions, we decided to undertake a test programme in which a large number of people would be subjected to varying conditions of individual air outlet velocity and temperature, varying cabin ambient temperatures and varying humidity.

Test Procedure

" Test subjects were seated in airline type seats within a mock-up of a 15-ft. section of the passenger cabin. The outlets were adjusted so that the air was directed against the subject's face and were not moved throughout the test. At each cabin ambient temperature the subjects were given about 10 min. for acclimatization. They then were subjected to varying conditions of gasper velocity and temperature as shown in table I. After each condition was set up the subjects were asked to indicate their reactions as to general comfort, comfort with respect to the previous condition, temperature of the air from the gaspers and gasper air velocity.

Discussion of Results

" Table I lists the test conditions and shows the percentage of people feeling most comfortable at each of a set of conditions for numbers 1a through 9b, and the number of people feeling most comfortable for conditions number I-1 through II-10. Tables II, III and IV show the number of people checking each reaction at the various conditions of cabin ambient temperature and humidity, individual air outlet velocity and discharge air temperature.

TABLE III

95° F. CABIN AND 15 PER CENT. R.H.

Air velocity, f.p.m.	0	365		500			600			700		
Outlet air temperature, ° F.	—	88	80	89	85	79	99	90	79	107	96	79
Reaction	Number of people responding											
Comfortable	0	4	1	3	1	0	4	1	4	5	3	3
Warm	42	12	33	11	24	13	13	13	11	13	32	11
Uncomfortable	60	7	39	10	32	3	5	26	1	6	10	2
Hot	4	1	1	0	1	0	2	1	0	0	1	0
Gasper air too hot		6	43	6	32	7	6	29	7	7	25	7
Air just right		18	31	18	24	9	17	29	9	17	32	9
Air too cool		0	0	0	1	0	1	0	0	0	0	0
Air velocity too high		2	0	7	7	2	11	21	10	19	33	11
Velocity just right		11	35	14	41	12	13	33	5	5	23	5
Velocity too low		10	39	3	10	2	0	4	1	0	1	0

TABLE IV

95° F. CABIN AND 57 PER CENT. R.H.

Air velocity, f.p.m.	0	365	500	600	700
Outlet air temperature, ° F.	–	80	85	90	96
Reaction	Number of people responding				
Comfortable	0	0	0	0	0
Warm	1	2	2	2	2
Uncomfortable	7	6	6	6	6
Hot	0	0	0	0	0
Gasper air too hot		5	6	5	6
Air just right		3	2	3	2
Air too cool		0	0	0	0
Air velocity too high		1	3	3	4
Velocity just right		5	4	5	4
Velocity too low		2	1	0	0

" An examination of the tables shows that, considering that if the velocity is too high the passenger can close down the outlet, 600 f.p.m. will satisfy 100 per cent. of the people at a cabin ambient of 85° F. and 20 per cent. R.H. and 95 per cent. of the people at a cabin ambient of 95° F. and 15 per cent. R.H. A velocity of 700 f.p.m. will satisfy 99 per cent. of the people at a cabin ambient of 95° F. and 15 per cent. R.H.

Conclusions

The findings of this test programme may be summarized by the following points :—

Adding a boost fan is a feasible method of improving the individual air distribution system performance;

The objective for this system should be a minimum air velocity of 600 f.p.m. measured at 18 in. from the outlet, with all outlets open ;

The passengers will feel comfortable at a lower face air velocity if : the cabin ambient temperature is reduced or the temperature of the gasper air is reduced ;

With elevated cabin relative humidity, the face air velocity does not have as much effect on increasing passenger comfort as when the cabin air is comparatively dry.

Liquid Oxygen System for the VC-10

ON the occasion of the 1960 Farnborough Air Show, "M.R." published some details of the air-conditioning system to be fitted to the new VC-10 aircraft of Vicker's.

In this article is described the VC-10's converter system which has been designed and developed by Normalair Limited.

Liquid oxygen converters provide a means whereby oxygen is stored as a liquid and delivered to the user in gaseous form. Such a device means that it is possible to store oxygen much more economically in regard to space and weight, since a given volume of liquid oxygen at atmospheric pressure will generate at

least 840 times the same volume in gas. Had the VC10 used a conventional gaseous oxygen system, twelve 2,050 litre cylinders would have been required. These would have occupied 9 c.ft. of additional space and weighed about 200 lb. more than the liquid system.

In providing oxygen for both passengers and crew of high altitude civil transport aircraft, it is essential to make sure that the crew is always left with sufficient oxygen to complete a flight irrespective of the demands made on the supply by the passengers. Early converter systems had only a single delivery point provided on the container so it was necessary to use separate converters for the crew and passengers.

The Normalair system uses a single converter and yet separate supplies can be maintained. This ensures reduced evaporation losses, a more flexible system, less installed weight and reduced maintenance. In addition, crew and passenger supply lines can be linked by a transfer valve in such a way that the passenger supply can be reinstated if the crew decide that oxygen can be made available to the passengers after the reserve level has been reached.

A circuit incorporated in the converter system ensures greater stability of the delivery pressure during flight which also considerably reduces the evaporation losses due to heat transfer. This is achieved by arranging for any excess pressure that might build up above the liquid in the converter during standby periods, or due to temperature influences in flight, to be breathed by the crew until the pressure reduces to the normal working value. When this has been reached the supply to the crew is from the container in the normal manner.

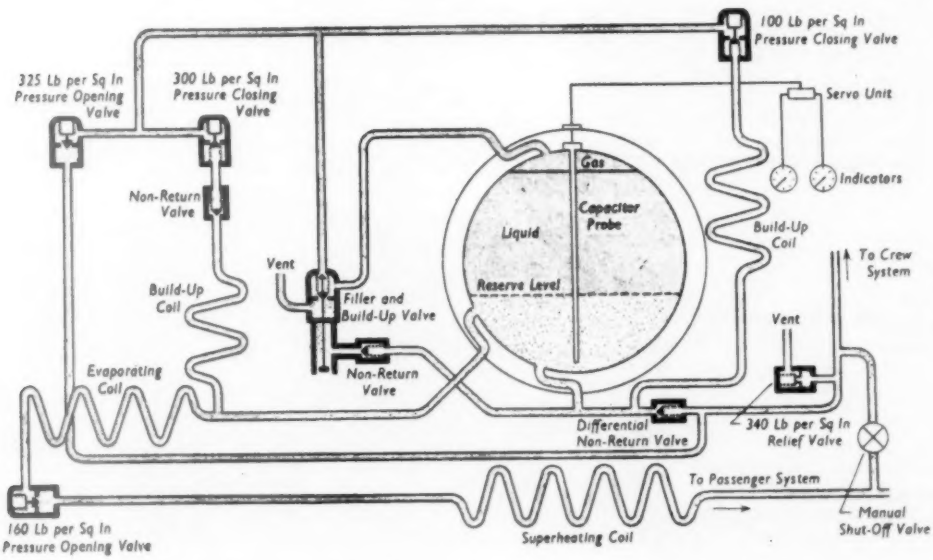
The capacity of the converters ranges from 10 litres upwards—the VC10 has one 35 litre bottle and saves a weight of over 200 lb. They consist of an assembly comprising a vacuum insulated container complete with its associated control valves. Any desired mounting can be fitted to suit particular installation requirements. To suit specific applications the container may be installed remotely from its control valves.

The oxygen supply system is completed by a combined charging connexion and build-up and vent valve, a superheating coil and a capacitance type contents gauge. By associating these items with the converter assembly an empty converter can be replaced by one which is fully charged. This type of installation is most suitable for the smaller sizes of converter. It is current practice, however, to install these items separately and in such installations the charging and build-up and vent valve are generally fitted under the aircraft skin, the changeover from the charging to the build-up position being entirely automatic. Charging is carried out with the converter *in situ* in the aircraft. Only the normal precautions are necessary and the only special equipment needed is to ensure that the liquid oxygen is introduced under a pressure of 20 to 30 lb. per sq. in. Because charging is carried out at such pressures the oxygen is much safer to handle.

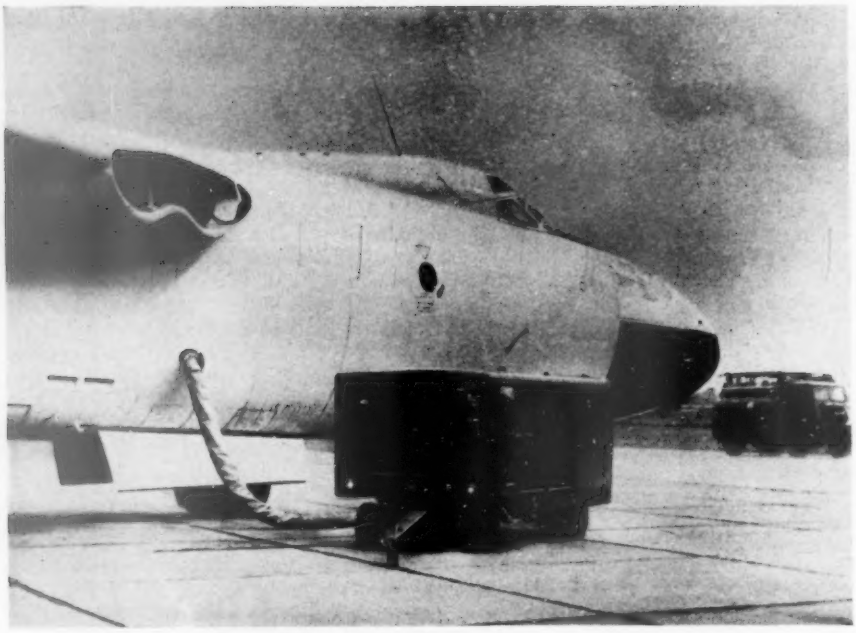
The crew supply is delivered at 70 lb. per sq. in. and is manually controlled, reducing valves being fitted in the masks. Passenger supply is delivered at 40 lb. per sq. in. for normal use and 80 lb. per sq. in. for emergencies. Should for any reason the cabin pressure fail, passenger oxygen masks drop out from recesses in the light luggage racks and are presented within easy reach of each passenger. The system is triggered by a pressure sensing device at the flight engineer's station. The VC10 is also equipped with "plug in" oxygen sockets at every seat row—in place of the portable bottles currently carried in jet airliners—for passengers who are feeling "off colour." This part of the system and the drop down masks have been developed by the Walter Kidde Company Limited, Belvue Road, Northolt, Middlesex.

Assume that the converter is charged and that the

(*continued on page* 938)



The circuit for the liquid oxygen converter for the VC10.



Pre-flight cooling down of Cabins and Equipment

RAF Style

Fig. 1.

CONTROLS IN THE AIRCRAFT INDUSTRY*

By R. W. J. S. PARSONS, A.F.R.Ae.S.

THOUSANDS of Danfoss controls have been used in the aircraft industry of Great Britain. They are being used particularly in the military field, with the Royal Air Force and the Indian Air Force, all over the world.

Let us discuss why these controls were used. They have been used on ground equipment which supply the cooling needs to aircraft on the ground when it is not possible to utilize the power of the aircraft engines and if it were it would obviously be uneconomical to do so. Further, the aircraft cooling machinery for the flight case is nothing like so great as that needed at ground level. Auxiliary power units installed in the aircraft have been thought in the past to be one way of providing this service on the ground as well as being used to air start jet engines.

It may be of interest to mention that the electrical equipment to start these engines would be large and that air starting is very convenient as the a.p.u. itself is a small turbo-jet. A Boeing 707 engine needs 2 lb. of air per second at a pressure 45 p.s.i. for 30 seconds at a maximum temperature of 275° C. to start. It was the bleed air from the compressor of the a.p.u. turbo-jet which would have been passed through an expansion turbine to provide ground cooling. However, these requirements are now being satisfied by a series of ground servicing trolleys, those for ground cooling designed by M. L. Aviation using Danfoss controls.

What is the importance of ground cooling services ? You may say that until recently and even now that aircraft ground cooling is not a common service. An answer to this is that we used to drive cars without windscreen wipers, without heaters and without windscreen washers, but once having had these facilities and making our driving more comfortable, few of us will drive without them.

A modern aircraft is a cylindrical metal shell with the minimum number of doors and windows and the size of these are as small as possible to reduce the stresses structurally for the aerodynamical and pressurization cases. Consequently, when they are

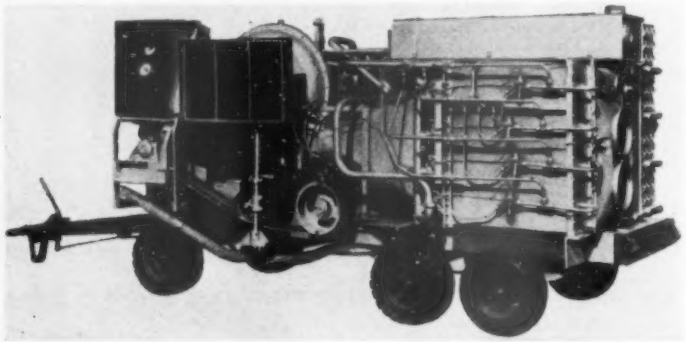


Fig. 2.—Coolair mk. 5 with canopy removed.

* Reproduced by courtesy of *Danfoss Journal*, Nordborg, Denmark, from which it has been slightly adapted.

BEA Style

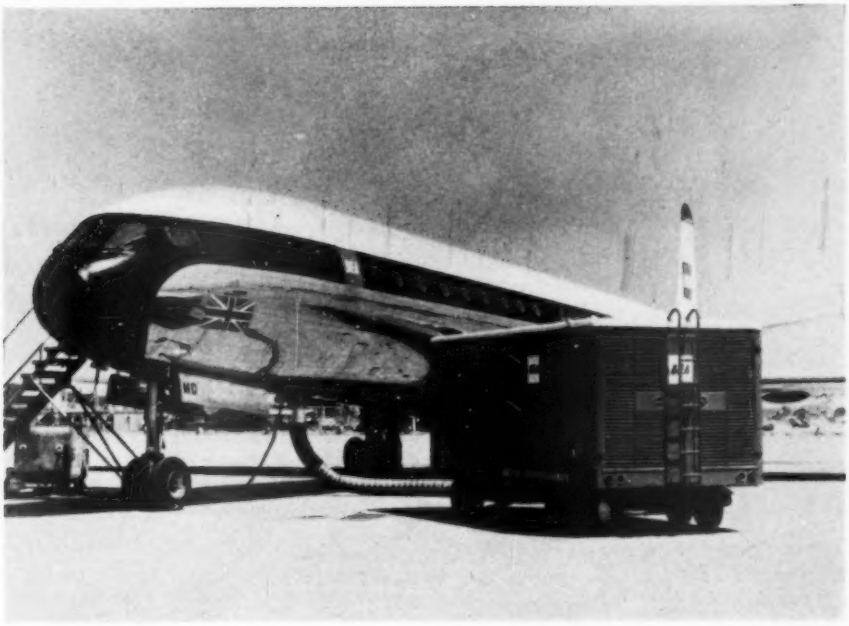


Fig. 3.

left to soak in solar radiation they become ovens in the sub tropics and tropics and can in more temperate climates be unpleasant at high summer temperatures. It is not unusual for aircraft temperatures to reach 140° to 160° F. in ambient temperatures of 110° to 120° F. and these are not the worst cases. Once passengers and crews, not only of civilian aircraft, but also the crews of military aircraft, have had the facility of comfort cooling they realize the necessity and in the latter case to obtain full efficiency. Other requirements are those of cooling the radar equipment and other compartments containing electronic and electrical equipment when working or being tested on the ground. A further use in military aircraft is the air ventilated suit supply where Danfoss products are used.

Airline companies are now becoming more aware of the comfort needs of their passengers. Some I know have said—" Well ground cooling is a good thing but why should we supply the facility when our competitors do not." Such an airline is blasé to its treatment of passengers which is uneconomic in the long run, but this line of thought is ending as also are the poor air-conditioning systems for the ground cooling case, as far as the aircraft designer is concerned.

Which system are we going to use ? Luckily for Danfoss we use the vapour compression cycle and not the air cycle, but luckily is the wrong word, as there are good reasons for adopting the vapour cycle, such as : —

1. The ability to cool the flow of air to the cabin independently of the pressure of which the air has to be supplied. It could be that in the air cycle method of cooling that at a given pressure there may not be sufficient pressure drop available to give the degree of cooling required.
2. Much less power is required in the vapour compression cycle, about a fourth theoretically but in practice, to allow for the power requirements of the air supply fan, the condenser fans and the heati nput of the air supply the net result is a third of the power compared to that of the air cycle system.
3. The machinery is operating at considerably lower speeds in the vapour cycle case therefore there is less wear and maintenance.

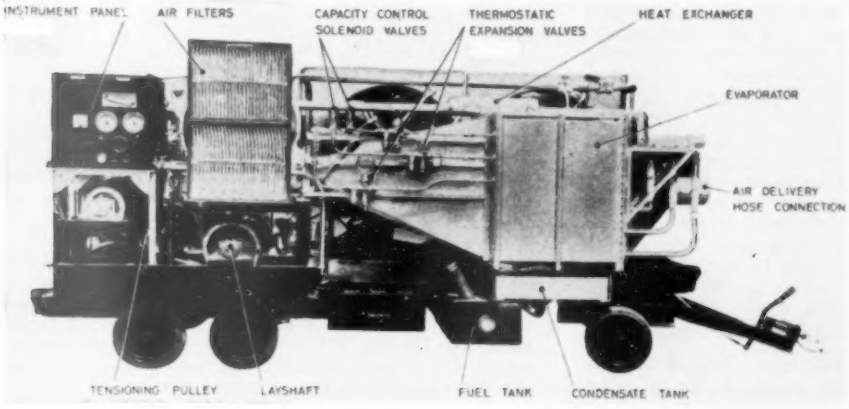


Fig. 4.—Coolair mk. 6 as used with Comet 4B above.

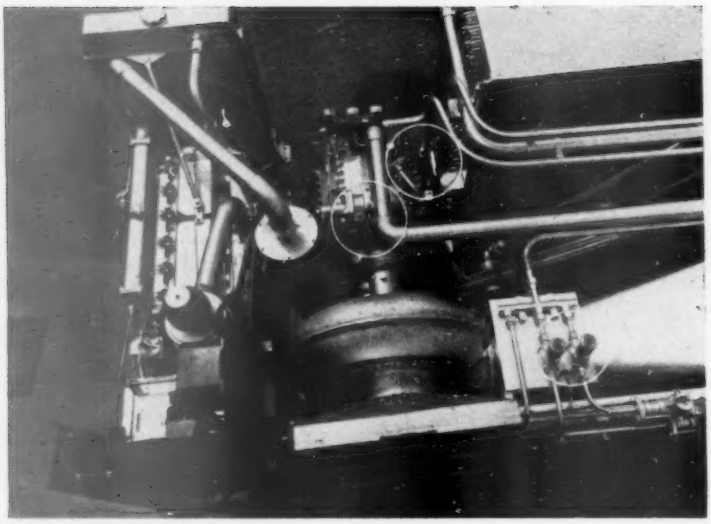


Fig. 5.—Coolair mk. 6 showing three thermostatic expansion valves solenoid capacity control valves.

4. There is a tendency, due to the high velocities of air delivery, for water vapour to be carried over to the delivery hose in the air cycle case working in humid conditions.

The Coolair Mk. 5

We will consider this item of equipment first as by far the largest number of Danfoss products have been used in its production. It was designed to meet the space, radar and black box cooling requirement of British V class bomber aircraft. The design requirement was to supply 100 lb. of cooled air per minute into the following mass flows, 45 lb. per minute for space cooling, 45 lb. per minute for black box cooling (as special equipment cooling is often referred to) and 10 lb. per minute for cooling the radar scanner.

In figure 2 the Coolair Mk. 5 is seen with the canopy removed. The more prominent items can be seen. The unit is powered by a Ford industrial petrol engine giving 40 b.h.p. at 3,000 r.p.m. (12 hour rating). This drives a layshaft from which drives are taken to the main air supply fan absorbing 12·5 b.h.p., the condenser fan absorbing 2·9 b.h.p. and the Lightfoot No. 7. compressor absorbing 21 b.h.p. Vee belts are used and tensioned by adjustable rollers. A centrifugal clutch is used which engages at 2,000 r.p.m. The nominal cooling capacity is 129,000 B.t.u. per hour at an ambient condition of 110° F. D.B. 30 per cent r. humidity when supplying 2,000 c.ft. per minute at 23 in. water gauge. This airflow is drawn through a millivee filter, which is renewed when a resistance of 0·8 in. water gauge pressure is recorded and will filter particles down to 5 microns in size. The air is delivered through the evaporator where its speed is limited to 400 ft. per minute, to allow the moisture to fall and is passed through water eliminators as the air is 98 per cent. relative humidity when the dewpoint has been reached during cooling. The air is passed through a plenum chamber where orifices have been chosen to give two mass flows of 45 lb. of air per minute delivered to the aircraft through two 5 in. diameter hoses and 10 lb. of air per minute delivered through a 3 in. diameter hose.

In this refrigeration circuit the refrigerant-12 is passed through an air cooled condenser to a liquid receiver. An air cooled condenser is used as a clean supply of water is not readily available where these units are in use and there is the added complication of water pumps, spray units and the weight and size of the water tanks. An air flow of 12,000 c.f.m. is passed through the condenser. From the liquid receiver the R-12 passes through a Danfoss solenoid stop valve type EVSO 16, the Danfoss drier type KFF and on to the four Danfoss expansion valves type TVNEF 5, and so to the suction side of the compressor.

The system of capacity control is achieved by the fitting of a Danfoss capacity control valve, type JVKA-35, which allows a hot gas by-pass to inject directly into the coils of the evaporator after the expansion valves.

The Coolair Mk. 6

This unit has been designed to give the ground cooling service for civil aircraft of the De Havilland Comet 4 B, Vickers Vanguard and like aircraft. Figure 3 shows the Coolair Mk. 6 operating with a Comet 4 B aircraft. The layout is similar to the Coolair Mk. 5 and need not be further referred to. Three Danfoss thermostatic expansion valves, figure 4, and Danfoss solenoid capacity control valves type EVSO 16, can be seen when the canopy is removed.

The Coolair Mk. 6 delivers 2,500 c.ft. of filtered air per minute against a back pressure of 16 in. water gauge. The maximum cooling capacity is 240,000 B.t.u. per hour in an ambient condition of 110° F. 60 per cent. relative humidity. Air is drawn through a filter and the fan delivers the air through 25 ft. of 10 in. diameter insulated hose, ground connexion into the aircraft air-conditioning system. The ground connexion is standardized on British and American aircraft and most airlines are operating these aircraft, apart from the U.S.S.R. although we must not forget the French Caravelle. It is important to note that the hoses must be bonded from aircraft to the Coolair units and a drag chain fitted to earth static electricity. No water is deposited in the aircraft as the hose is in the sun and the heat absorbed in the aircraft system due to back pressure quickly expands the air such that the relative humidity is quickly relieved.

SWEDISH JOURNEY

ONE of the most pleasant ways of journeying to Sweden, certainly so if one intends to take a car along, is via the Tilbury-Gothenburg route of Swedish-Lloyd whose two steam turbine vessels, the *Britannia* and the *Suecia*, maintain a twice-weekly service in the summer.

These 30 (plus)-year-old ships, built incidentally at Newcastle upon Tyne, lack the lustre (fortunately) of to-day's floating gin palaces; however, solid mahogany and brass fittings still convey a sense of quality in things maritime.

Whether travelling north-east from Tilbury or south-west from Gothenburg, these elegant little liners ply with such regularity that their " toots " of salutation when passing each other within a few hundred yards in the middle of the North Sea may be said to be precision timed. The run of 36 hours, from Saturday evening to Monday breakfast in the present instance, is a tonic for the business man and wastes none of his precious working week.

* * *

The representative of " M.R.'s " hosts was alongside Gothenburg's London Pier on this summer Monday morning at 6.50 a.m. (membership of the Outer Seven has already had a noticeable effect on the working hours of Britain's business men for who would have contemplated such an early start a few years ago ? Will the more Latin atmosphere of " The Common Six " mitigate this influence ?).

The illustration at the top of the page shows Levin cabinets in Martin Olsson's Supermarket at Farsta Centre.

Mr. P. W. Dahlgren, STAL's west coast representative, is tall, lithe and cheerful. He spends most of his spare time sailing with his two sons, who at the ages of 15 and 13, handle with equanimity, like most Scandinavians, deep-sea sailing boats with or without father aboard.

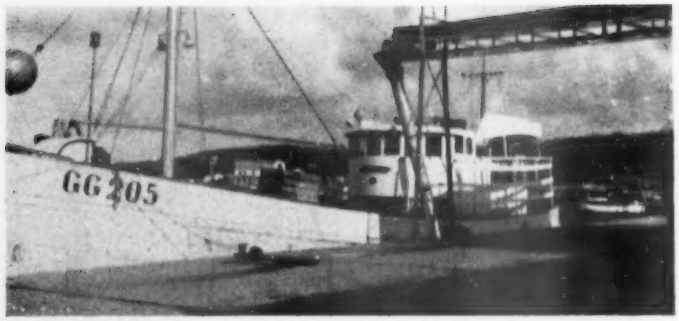
An eight-mile journey in the Volvo brought us to Fiskeback, a useful little port round the coast from Gothenburg. Point of interest here was STAL Refrigeration's new tube ice plant, near the water's edge, for refrigerating the local trawlers.

In this tube process, ice is produced by freezing rapidly flowing water. This means that salts and impurities are not retained in the ice but are automatically flushed away by draining off a proportion of the salt-enriched water. Even hard water is said to yield tube ice just as clear and pure as soft lake water. This feature is particularly appreciated by fishermen, who can get better prices for fish that has retained its brightness, without the film of lime which often appears with some types of artificial ice.

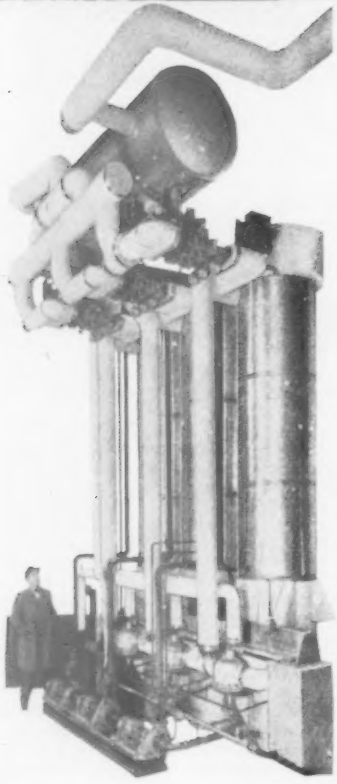
The tube ice generator consists of a vertical shell and tube unit, surmounted by a water tank. Special water diffusers, situated at the top of the tubes, are designed in such a way that the water flows down spirally on the inside of the tubes. The water is collected in a tank below the freezer, from where it is returned by a pump to the top tank.

The liquid refrigerant evaporates in the shell and generates layers of ice inside the water tubes. When the ice formed has grown to the desired thickness, the water circulation is stopped and the water collects in the bottom tank. A system of solenoid

Modern trawler " Ganthi III " waiting to take on ice from . . .



. . . the tube ice plant at Fiskeback.
Below: The special crane " grab " system for moving the ice to the chute.



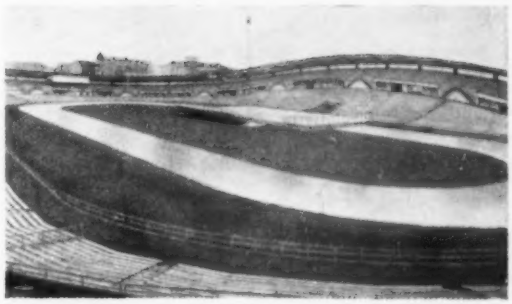
Left: The heart of the tube ice plant, the vertical evaporators. Picture shows Mr. Dahlgren.

valves works automatically, so that warm gaseous refrigerant flows into the shell-and-tube unit and rapidly drives the cold liquid to a low-pressure receiver located at a higher level.

At the instant when all liquid has left the unit, a special stop valve closes in order to trap the warm gas inside the evaporator. The warm gas condenses on the outside of the cold tubes and it then only takes a minute for the ice to thaw sufficiently in order to free itself and slide down.

Just before the ice begins to slide the cutter starts up. It consists of a knife mounted immediately beneath the bottom of the shell-and-tube unit on a vertical shaft which passes through the centre tube and rotates in it. The shaft is vee-belt-driven at its upper end by an electric motor. As the ice sticks fall they are rapidly lopped off by the rotating knife.

The broken ice falls into a rotating basket, mounted beneath the knives and on the same shaft. The ice water which accompanies the falling ice is thrown out through slits in the basket by the rotation. The basket widens towards the top, and the ice is therefore driven upwards by centrifugal force and thrown out through an outlet duct. When the ice has thus been collected, the warm gas is shut off, the cutter is stopped and the water circulation turned on. The liquid refrigerant in the low-pressure receiver flows back to the shell-and-tube unit and a new freezing cycle commences.



Speed rink and ice hockey rink in Gothenburg.

Farsta Centre, Stockholm.

To prevent the knife from freezing up, the bottom plate of the shell-and-tube unit is specially heated.

The Fiskeback plant can produce approximately 45 tons of ice a day. There are close on 20 of these plants situated round the west coast of Sweden alone. This low cost ice production method is becoming increasingly popular also on the Continent —recently STAL got a 300 ton/24 hr. order for Portugal.

* * *

An outstanding installation of STAL's in Gothenburg is at the famous Ullevi Stadium which is the headquarters of Gothenburg's crack football team and which also contains a speed skating rink and an ice hockey pitch.

The installation, in fact, consists of a racing rink built together with an ice hockey rink, and a free-standing ice hockey rink outside the Stadium for practice use. The first two of these units are located in the middle of the arena and so designed as to permit quick dismantling at the beginning of the football season and quick assembly when it ends. Special provisions have been made for the easiest possible transport of pipe sections and for ready access in the event of repairs.

New Milk Centre in Norrköping (right), with heavy tanker about to leave (below).

The outer ice hockey rink is a permanent installation which is built to serve during the warmer months of the year as a tennis and training ground.

Ullevi's refrigerated ice rinks constitute the largest installation of its kind in the world. A high degree of automatic operation based on electronic devices ensures even regulation of temperature and reduces supervision to a minimum.

The refrigerating plant of the Ullevi Stadium includes four nine-cylinder 175-h.p. STAL compressors. The refrigerant is " F-22." The four compressors can remove a total of 5,161,000 B.t.u. per hr. from the rink. The plant also includes four 55-h.p. brine pumps and two 15-h.p. pumps for the cooling water.

The cooling water pumped through the condensers is taken from the Molndal River. The condensers are of vertical shell-

and-tube type, easy to clean on the water side without interrupting operation. Before entering the pumps, the water passes through large filters.

The rinks consist of " mats " of steel tubing on which the ice-bearing course is built. The hop-dip galvanized tubing has a total length of 56 miles.

The plant is designed for completely automatic operation. The only adjustment required at the control station is the setting of the temperature desired at each rink. The automatic controls take care of the rest. In order to compensate the temperature difference which arises because the brine is being heated when passing through the rink pipes, the circulation direction of the brine is automatically reversed at short intervals. When the outdoor temperature changes, impulses from electronic equipment cause the plant to raise or lower the temperature of the circulating brine, as the case may require.

With an ice surface of the usual thickness, 10 or 15 minutes are sufficient to change the temperature. It is expected that the plant will maintain the temperature of the ice within a tolerance of less than one degree centigrade under normal conditions.

When the outdoor temperature is lower than the ice temperature desired, the automatic controls switch the plant over to warming instead of freezing, and the rinks acquire the " oily " high-speed surface favoured by skaters. Incidentally, Sweden is of course a country for outdoor skating rinks—STAL have just got the order for their 36th rink.

* * *

Having spent five hours visiting two highly interesting installations in Gothenburg, the writer sank into the comfort of the SAS Metropolitan plane for Stockholm (an " hour and a bit " away) contemplating that a fair day's work had been done for the start of a tour. The day's programme, however, was scarcely half-way through. No one visiting Stockholm should fail to see the Farsta Centre, the new experiment in living three miles or so from the city. Here located in relatively small confines is a self-contained suburb (this word " suburb " inadequately describes the area which has an atmosphere which is anything but " suburban ") with elegant stores.

One of the leading supermarkets here is Martin Olsson's, illustrated at the beginning of this article. The food departments are fitted with Levin refrigerated display cabinets and an imposing and colourful array they make. Behind the scenes are Levin cold rooms for food storage.

Practically alongside is the NK department store which is fully air-conditioned on its selling floors by STAL. Many readers may know the big NK-Department Store in Central Stockholm—it is now being air-conditioned and will have a 1,000-ton STAL plant when completed.

* * *

A quick visit was paid to the Stockholm cold store of the Helsingborgs Fryshus AB group which has its largest unit at

Modern facade of the Levin factory and offices at Malmö.

Halsingborg, with considerable premises also in Grimsby and, soon to be opened, in east London. Dipl.Eng. P.-O. Persson, who formerly was assistant to Professor Backstrom in Stockholm, is the chief engineer and development chief of the group, and he is carrying out considerable research on a variety of compressors in the main plant room of this building which is situated in the heart of the meat area of Stockholm, well away from the city (although no slaughtering is carried out there nowadays). Much attention is being given to the screw-type Swedish compressor which was described to The Institute of Refrigeration recently. Like the other cold stores of the group, the Stockholm premises are spotlessly clean, are painted in the most delightful pastel shades externally and are fully pattetized in their 22-ft. chambers. Incidentally, the London plant will have STAL machinery installed.

* * *

In the next three days many units of the STAL organization and of its parent company were to be visited. The parent company is, of course, De Laval Ljungström Turbine Company, and the background of this company spans the industrial history of Sweden. Industrial activity in the true sense of the word was first established in Finspong, south-west of Stockholm, in the 17th century. With varying success it has continued unceasingly ever since, constantly adapting itself to the changing times. The present century especially has involved tremendous expansion in all respects for the Finspong community. A very important contribution to this expansion has been the location in Finspong of an engineering industry based on Swedish inventive genius and traditional instinct for accuracy in connexion with design and work in iron and steel.

" It was not until the last two decades of the 19th century

New manufacturing bays at Levin's Malmö factory.

that technology—and the engineering industries in particular—was able to fulfil the need for precision of design that steam turbines and their mechanisms demanded ; but these requirements were so exacting that they undoubtedly and strongly influenced the design of industrial machinery and production methods" to quote STAL.

" Though there were many designers of turbines during this period, two predominated as pioneers : Charles Algernon Parsons in England and Gustaf de Laval in Sweden. They succeeded independently of each other in quickly arriving at such technical solutions of the problems presented by the steam turbine that the plant could be put into operation in workshops and power stations—though at first with relatively low power output. The combination of steam turbine and electric generator was a particularly welcome addition to technology and industry. It can be said that electrotechnique needed the steam engine for the operation of generators, at least where water-power could not be used advantageously. The steam turbine has held a place of special significance in the development of the three-phase generator. This is a good example of how two separate fields of engineering can influence each other, combining to form a new complex unit—which in this case is capable of transforming natural fuel into easily transportable power with many uses.

" The steam turbines of de Laval and Parsons marked the beginning of a brilliant period of development which is probably without parallel in thermodynamics."

STAL probably occupies a unique position in the manufacturing world in working with temperatures ranging from minus 112° F. in its various items of refrigerating equipment to 1,800° F. in gas turbines. It may seem paradoxical that an enterprise which manufactures heat engines also produces refrigerating equipment. In 1932, STAL included refrigeration in its programme when an old-established refrigeration division was acquired from A.S.E.A. Thus the traditions of STAL refrigeration go back to 1892. Today with its over £3,000,000 a year turnover STAL is an important industry in the field with world wide exports.

Since STAL produces a large part of Swedish installations and equipment designed for sub-zero temperatures—from cold-storage plants to deep freezers—the company has long been in an excellent position to effect developments in this field.

In marine refrigeration STAL pioneered " Freon " cargo installations 25 years ago.

The group is mainly organized according to products. Thus, the totally-owned subsidiaries STAL Refrigeration AB at Norrköping, de Laval Ljungström Apparat AB at Linköping and de Laval Ljungström Pump AB at Torpsbruk are responsible for refrigeration plants, heat exchangers, etc., and pumps, respectively. The parent company, at its works in Nacka, produces marine and land axial flow turbines, while the works in Finspong manufacture land steam and gas turbines.

New works at Norrköping completely devoted to the manufacture of refrigeration plant allow great improvements in that field at the same time as increased space is given to ever-expanding steam turbine manufacture at Finspong. In metallurgy, too, cold has achieved exceptional importance when teamed with heat processes : Cold-treating steel cutting tools and gauges is now practised as the final step in hardening. Equipment for this technique is produced at the STAL plant. STAL scientists work on problems that are concerned not only with the company's present-day production, but for the more distant future. The works are prepared to carry the progressive policy, long established at Finspong, into the atomic age.

Levin refrigerated display cabinets coming down the line at Malmö.

In the modern STAL plant at Norrköping a wide range of compressors are manufactured—from small semi-hermetics to the large " VW " types used for marine refrigeration. A high degree of specialization is practised here and much buying-in of small components is the rule. So far, fully-hermetic units have not been marketed although they will be coming along in the near future. Semi-hermetics are produced and an interesting development in this connexion is the " siamese twin," to use our own label, in the form of two hermetics mounted on a common base with a twin motor.

The managing director at Norrköping is Mr. Ivar Brandin whom many readers will have met at the international congresses of refrigeration. Sales director is Mr. John-Gabriel C. Montgomery, a tall and most personable gentleman who, like many of his compatriots, has spent a considerable time in the United States. The export director is Mr. E. Engelsen, a native of Norway, whose duties take him to every quarter of the globe.

Not far from Norrköping lies Linköping where STAL condensers and evaporators are manufactured on rationalized lines in the De Laval Ljungström Apparat A.B.—the heat exchanger factory of the group.

It soon becomes obvious to the visitor that a very high proportion of the refrigeration installations in Sweden have been

made by STAL. One of the largest milk collection and processing centres in the world has just been completed at Norrköping, containing the automatic Tetra-Pak filling plant which was illustrated in our July number.

This Milk Centre is linked to one of the most comprehensive milk tank schemes in Europe. The chain includes 418 tanks at the moment and 100 are planned for installation in the near future : sizes range from 250 to 6,000 litres. In addition, 20 lorries still pick up milk cans from producers who, at the moment, are too small to be included in the tank scheme. Collection is made over a radius of 25 miles from 2,200 farmers supplying 240,000 litres a day. A typical tank installation is one of 400 litres on a farm running only 10 cows. Every second day raw milk is collected and skimmed milk is dropped off at the farm in its place. The equipping of this factory is lavish in the extreme and the extensive STAL plant is needed not only for the heat exchangers but for cooling very large cheese maturing chambers.

Moving down to Malmö (the Stockholm-Malmö express is the crack train of Sweden and the run south is as smooth and comfortable as one could wish for ; one noticed Levin's automatic cigarette vending machines fitted in these coaches) one reaches the headquarters of another big name in refrigeration.

AB K. J. Levin have been in business in this delightful, most southerly of Swedish cities, for 30 years, while they have another factory at Klässbol for the production of home freezers which are to be produced at the rate of 30,000 pieces a year, as against 6,000 units only two years ago.

The Malmö factory of Levin's has been considerably enlarged since " M.R.'s " last visit two years ago. Refrigerated shop display cabinets are produced here exclusively and output is now 150 pieces a week. Branch offices are situated in Stockholm, Gothenburg, Sundsval and Halsingborg, and showrooms are now maintained at Karlstad, Eskilstima, and Kalmar.

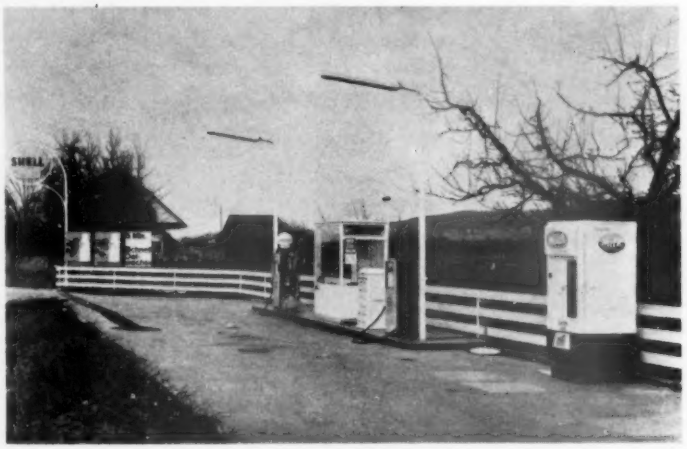
Since June 1 of this year there has been in existence an installation, after-sales and service arrangement formulated in co-operation with STAL Refrigeration, which will enable Levin to use the countrywide facilities of the latter company. On the other hand, one may expect to see most of Levin's shop cabinets in Sweden fitted with STAL compressors.

Levin's are extremely strong in the export world and Western Germany is still the largest importer of her cabinets, Great Britain has come into second place in a relatively short time.

The production floors have been practically doubled in area in the last year. The most modern methods of fabrication of these all-metal cabinets are in use ; for example, a new method of fusing aluminium sheets has been introduced with success.

Export director of this flourishing enterprise is Mr. Hugo Henriz, whose affability is well known to the refrigeration trade in Britain and elsewhere.

The " Pinta " Pump.—" Pinta " pumps have been appearing over the past few months on the forecourts of garages and filling stations. These are the refrigerated milk vending machines, installed to satisfy the thirst of weary travellers. These venders are also popular with housewives who live near the garages : a 24-hour supply of milk is very useful in emergencies. Now the " Pinta " pump trend has spread to the Continent. More and more venders are to be found on service and filling stations across the Channel. A Gloster milk vending machine has recently been sited at a large new garage in Kirchberg, on the main Zurich-Berne highway. As the first refrigerated milk vender ever installed in a garage in Switzerland it has been a sensation. The Swiss motoring public have taken to the machine, which is enjoying great popularity. A local dairyman supplies the machine—which holds 210 ½-litre Tetra Pak cartons—with milk each day. The Government's milk department has been supporting the new venture with enthusiasm, and the Gloster VM.2 vender has appeared on Swiss television, and been featured in a wide variety of newspapers. This vender was made in Gloucester by Gloster Equipment Ltd., a member of the Hawker Siddeley Group.



Air-Conditioning is Good for Guinness

30 Units Ordered by Irish Malsters

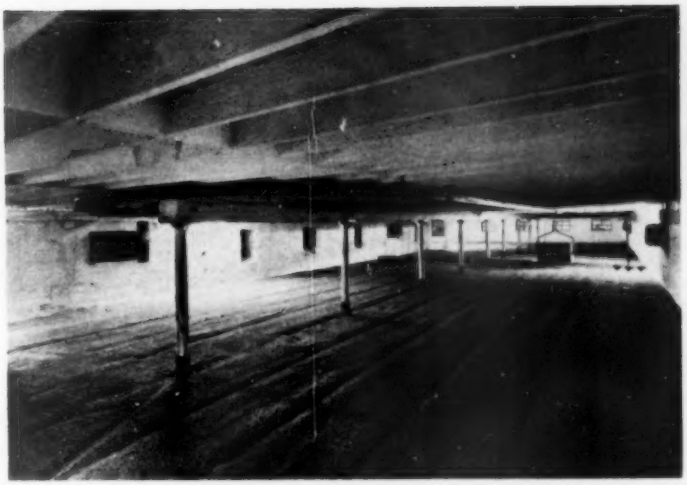
AN interesting application of the " Temkon " beer cellar cooler, manufactured by Temperature Ltd., is reported by their Irish agents, L. Sterne & Co. (Ireland) Ltd. Sterne have just supplied 30 of these units (which are normally used for the air-conditioning of public house cellars) for an installation which they designed for one of the malt houses owned by Robert Gibney & Co. Ltd. at Maryborough, Eire.

Robert Gibney, who produce malt from which Guinness is brewed, ordered the coolers in order to keep the temperature of the malt floors at a constant level throughout the year, since previously the malsters found that floor-malting during the warm months of May to October was most unsatisfactory.

The " Temkon " units were fitted into some of the existing window openings and the remaining openings were fitted with insulated frames and sealed off. Other sources of heat leakage were also sealed off and insulated, in all cases using Polyzote expanded polystyrene. Very little insulation was in fact needed since the walls, as can be seen in the accompanying photograph, are extremely thick.

Ten " Temkon " units were fitted on each floor (about 60,000 c.ft. capacity) and in addition two fresh-air intake and discharge fans were fitted at opposite ends of each floor to help dissipate the carbon dioxide given off by the grain that will tend to build up when all windows are sealed.

The " Temkon " unit specified for this job is a completely



A general view of one of the 60,000 c.ft. malt floors in a malt house owned by Robert Gibney & Co. Ltd., in Ireland. Three such floors were recently air-conditioned, using "TEMKON" beer cellar coolers, in order to permit satisfactory malt production all year round. The installation was designed by L. Sterne & Co. (Ireland) Ltd.

"packaged" air-conditioning plant, incorporating a hermetically sealed refrigeration system. It is suitable for operation in ambient temperatures up to 95° F. and thermostatic control will maintain the temperature on these malt floors at around 55° F.

Value of this order to Temperature is around £4,800 and after the performance of the installation at Maryborough was found to be satisfactory, L. Sterne & Co. (Ireland) Ltd. placed orders for units to be used in similar installations for P. J. Roche & Sons Ltd., Enniscorthy (30 coolers) and J. H. Bennett & Co. Ltd., Ballinacurra (25 coolers).

QUIZ FOR SERVICEMEN

The winning entries in our "Quiz for Servicemen" Competition came from :—

1. **Francis C. English,**
   16, Park View,
   Clowne,
   Chesterfield, Derbyshire.
2. **Ian Grant,**
   Lec Refrigeration Ltd.,
   Bognor Regis, Sussex.
3. **D. Hall,**
   23, Northfield Road,
   King's Norton,
   Birmingham, 30.

The above-mentioned readers have been awarded book prizes to the value of £5, £3 and £2, respectively.

H.M.V. APPLIANCES

The new H.M.V. Company (H.M.V. Domestic Appliances Ltd.) has started distribution to retailers. The first products to appear in the shops are : The H.M.V. steam/or dry iron with push-button control ; the H.M.V. automatic toaster with a thermostat control : the H.M.V. cylinder cleaner. All these electrical appliances have a de luxe finish and carry the H.M.V. guarantee. Major domestic appliances will shortly be introduced by H.M.V.

As part of their continued policy of expansion in the export market **Flexibox Ltd.**, Manchester, manufacturers of mechanical seals for pumps, compressors, mixers and other rotary equipment, and precision lapping machines, have announced the formation of two new subsidiaries in Italy and Australia. This follows the formation in April of a subsidiary in Holland—Flexibox N.V. The new Italian company—Flexibox S.p.A.—commenced operations on July 1. It has been formed jointly by Flexibox Ltd., and their present Italian agents—Tecnologie Industriali—and will operate from Via Mauro Macchi 27, Milan.

In Australia the new subsidiary will be known as Flexibox Pty. Ltd. and is owned jointly by Flexibox Ltd. and Harland Engineering (Australia) Pty. Ltd., Footscray West, Victoria. The Flexibox group of companies already includes Flexibox S.A. in Paris and Flexibox G.m.b.H. in Frankfurt in addition to the parent company —Flexibox Ltd.—in Manchester.

MINISTER'S VISIT

The Minister of Agriculture, Mr. Christopher Soames, spent nearly two hours at the Grimsby factory of Birds Eye Foods Ltd. last month. This was part of a two-day tour of the Humberside fishing industry, his first since taking office. Afterwards he said he was fully alive to the fact that quick-freezing had revolutionized both fishing and agriculture in this part of the country.

REFRIGERATION FOLLIES . . . No. 7

"Do you have a copy of 'Modern Refrigeration'?"

English Electric's Super-Clean Building

(*continued from page* 925)

The upper floor of the plant room, fig. 6, contains in the foreground one of the insulated supply fans, and parts of three others and their ducting are also discernible. One of the spray-type air-conditioners, in which the air is attemperated and humidified or dehumidified according to the vagaries of the weather, is visible on the right. The air is precleaned by A.C.I. Roll-o-Matic filters located in a penthouse; these are constructed as a camera film and their inching action ensures even filtration throughout their life, and disposal and recharging are similar to those of a camera.

The general view of ground floor plant room, fig. 7, embraces the central refrigerant evaporator of sectional raceway float controlled type with directional control of flow of secondary anti-freeze refrigerant maintains a constant temperature plus or minus $\frac{1}{4}$°F. at any of the draw-off points. The refrigerant compressors and condensers by William Douglas & Sons Ltd., fig. 7, were selected due to the faithful service rendered under exacting conditions in other special laboratories of the English Electric Group. It will be seen that space for further units remains in the event of future expansion.

Liquid Oxygen System for the VC-10

(*continued from page* 927)

liquid oxygen system is coupled to the aircraft distribution system. The build-up and vent valve is automatically held in the build-up position by spring action. From the container, liquid oxygen passes to both build-up coils gaseous oxygen flows through the pressure closing valves. This pressure gradually increases until 100 lb. per sq. in. is reached. At this point the 100 lb. per sq. in. in pressure-closing valve closes; the 300 lb. per sq. in. in pressure closing valve remaining open until 300 lb. per sq. in. is reached, when it also closes.

At this stage, oxygen at 300 lb. per sq. in. is supplied to the crew and passenger supply systems from the respective outlets in the container. This pressure is maintained unless conditions are such that the liquid level falls below the passenger take-off point when the 300 lb. per sq. in. in build-up circuit becomes inoperative and the passengers continue to receive oxygen from the gas phase until the pressure in the delivery line falls to some 160 lb. per sq. in. At this point the passenger line is closed and no further oxygen passes to the passenger system. Oxygen continues to go to the crew at a maintained pressure of not less than 100 lb. per sq. in. by a build-up circuit associated with the 100 lb. per sq. in. pressure closing valve.

If the system has been in the "standby" position for some time, the system pressure may have risen above 300 lb. per sq. in. due to absorption of heat by the converter. Under such conditions the pressure opening valve will remain open and a relief valve will prevent the pressure rising above 340 lb. per sq. in. Demands by the crew will initially be met via the pressure opening valve until the system pressure reduces.

Continued demand reduces the pressure downstream of the pressure opening valve until at 320 lb. per sq. in., 5 lb. per sq. in. has been established across the differential non-return valve, at which value it opens. Further demand is met from the container by a flow of liquid oxygen, the liquid vaporizing in the build-up coil. A pressure of at least 300 lb. per sq. in. is maintained on the gaseous side of the container to ensure a delivery pressure in excess of 295 lb. per sq. in. at all times.

The container's liquid content is shown on one or more indicators by a capacitance type gauge system. The container incorporates a probe unit, the functioning of which is not affected by the aircraft's attitude.

The Institute of Refrigeration Bulletin

Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.4 (CENtral 4694).

INSTITUTE COMMITTEES, 1961-62

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ASHRIDGE COLLEGE

Medium and smaller-sized companies planning the training and development of their executives may be interested to learn that the one-week residential course of executive training planned to meet the needs of managers in the medium-sized and smaller enterprises held at Ashridge College in February this year was so successful that it has been decided to offer a second similar course during the week October 9 to 13, 1961.

The Ashridge programme for the remainder of this year also includes two further one-month residential executive courses:—

AEC 561 September 4 to September 29
AEC 661 October 30 to November 24

These aim at increasing the effectivenes of executives of industrial and commercial enterprises—both public and professional—who have had some experience in the exercise of managerial responsibility.

Further details of these courses, nomination forms and illustrated prospectus, can be obtained from The Principal, Ashridge College, Berkhamsted, Herts., telephone Little Gaddesden 3191.

BRITISH STANDARD FOR LETTER SYMBOLS, SIGNS and ABBREVIATIONS PARTS 2, 3, 4 and 5

Four new parts of BS 1991, the British Standard for letter symbols, signs and abbreviations, have been issued.

Part 1 of BS 1991 was issued in 1954. It contains recommended symbols, signs and abbreviations for the fundamental quantities of interest to physicists, chemists and engineers. As far as practicable, these recommendations follow the decisions of international organizations. In addition to the actual symbols recommended, other important matters dealt with include the principles governing their choice and their layout in printed articles. In the additional parts now published, the principles and recommendations of Part 1 have been followed, and the interconsistency of all the parts maintained as far as practicable.

The additional parts now issued are entitled:—

Part 2: Chemical engineering, nuclear science and applied chemistry.

Part 3: Fluid mechanics.

Part 4: Structures, materials and soil mechanics.

Part 5: Applied thermodynamics.

The new parts give symbols for quantities and abbreviations for units in the fields covered by their titles. A selection of the symbols and abbreviations recommended in Part 1 (General) is also included in each part to avoid the need for frequent reference to Part 1.

In Part 2, the rapid development of nuclear science has made difficult the preparation of a list of symbols. Those recommended are based as far as practicable on current conventional usage in this country. In a few instances terms have been omitted when there is no general agreement on the symbols to be used.

In Part 3, the recommendations relate to those fields of fluid mechanics which are concerned with fluid properties; fluid motion; open and closed conduits; aerofoils, wings and other bodies; propellers and fans; and turbo-machinery.

Part 4 deals with constructional engineering; aircraft structures; soil mechanics and stress analysis. Stress analysis is sub-divided in elasticity, plasticity and photo-elasticity.

Part 5 deals with steam engines (reciprocating steam engines and steam turbines); internal combustion engines; gas turbines; reversed heat engines; and heat transfer. It also includes a list of symbols for turbo-machinery.

A detailed list of dimensionless parameters is included in Part 2; some of these are also given in Parts 3 and 5. Useful information on subscripts is given, particularly in Parts 4 and 5.

Close co-ordination between the new parts and with Part 1 has generally been effected. In a few cases it has not been found practicable to recommend that the same symbol for a given quantity should be used in all the parts. For example 2 is recommended for "torque" in Parts 1, 2 and 4 but in Part 3 Q is the recommended symbol owing to the use of T for "thrust" in fluid mechanics.

Part 1 was amended in October, 1960 by the issue of PD 3920 which gives the more urgent modifications required to preserve the interconsistency of all five parts. A comprehensive revision of Part 1 will shortly be commenced.

Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1.

Copies: Part 2: 10s.; Part 3: 7s. 6d.; Part 4: 12s. 6d.; Part 5: 7s. 6d.

(Postage will be charged extra to non-subscribers.)

NEW TECHNICAL COLLEGE PREMISES

NOW in the final stages of completion, the second phase of extensions in the development programme at the Wigan and District Mining and Technical College, will make the college one of the most up to date in Great Britain.

In keeping with this claim, the latest scientific and engineering advances have been used to equip the recent extensions—including the provision of air-conditioning in a new metrology laboratory.

To ensure absolute accuracy of research experiments conducted in the metrology laboratory, an air-conditioning unit manufactured by Carlyle Air Conditioning & Refrigeration Ltd., London, is being employed to maintain a constant atmospheric condition.

The installation comprises a Carlyle split packaged type air-conditioning unit, which will have the capacity to maintain 65° F. + or — 2° F. and 60 per cent. relative humidity at a summer design condition of 80° F. and 32 per cent. relative humidity.

Both units are situated outside the conditioned area. Ducted air is taken from the fan coil section of the unit which is complete with hot water coils, through humidifiers and passed into the laboratory where it is distributed from three ceiling diffusers. Return air is taken at low level through a single grille and mixed with a proportion of outside air before returning to the unit.

Established in 1857, the college is one of the oldest in the country and, since its formation, has provided advanced technical training up to graduate level. In recent years the number of students in attendance has increased rapidly from 2,500 to 6,000. This influx seriously strained existing facilities and prompted a bold expansion programme.

The first phase of extensions was opened in 1953 by H.M. the Queen, and together with the latest additions the cost of building and equipment has exceeded £1,000,000.

Main heating and ventilating contractors are Rosser & Russell Ltd., London, and the system was designed and installed by Fuel Efficiency Co. Ltd., a main dealer for Carlyle.

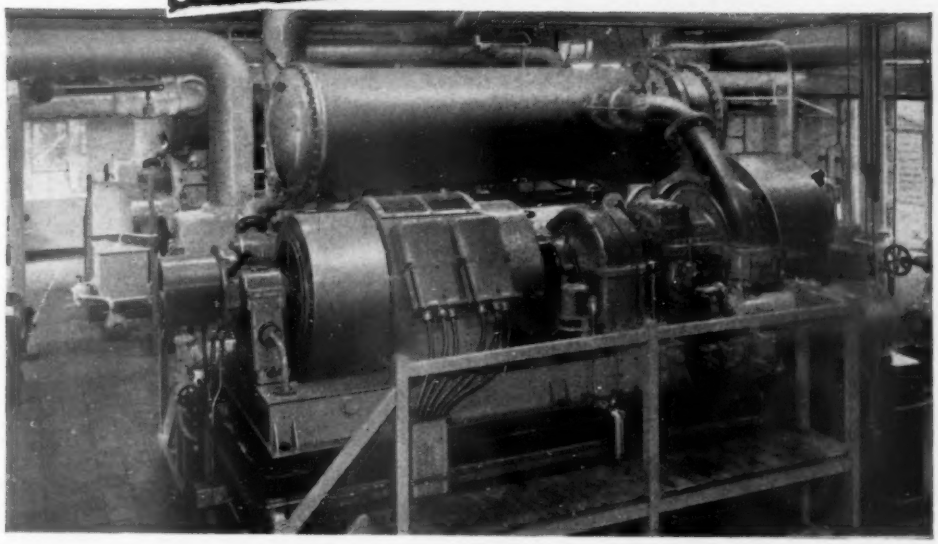
The architects for the college extensions were Howard V. Lobb & Partners in collaboration with Design Partnership.

FOOD TECHNOLOGY TRAINING

The fully-illustrated prospectus of the National College of Food Technology for 1961–62 reveals how pleasantly situated are the buildings on the edge of St. George's Hill in Weybridge, Surrey. The college is a residential one with hostel accommodation for about 80 students, almost wholly in single study-bedrooms. A large assembly hall, a lecture theatre, refectory, library, reading rooms and common rooms are among its other amenities. The new food processing and engineering laboratories have been equipped with pilot scale plant and provide facilities for basic food engineering studies and for practical instruction in all the major food processing operations such as canning, refrigeration, quick-freezing, evaporation and dehydration, emulsification, pasteurization and sterilization.

Refrigeration companies were very adequately represented at this year's Royal Highland Show in Edinburgh emphasizing the continuing interest in the agricultural market. Apart from the growth of domestic equipment used in farming communities, and farmhouses, the development of packing stations in various centres has given an outlet for commercial plant which has been growing steadily. The poultry packing industry has been particularly active in this field and a number of large-scale packing stations have been laid down, with more pending.

1,800 TONS of REFRIGERATION for KODAK Ltd.



The illustration shows one of the four CENTRIFUGAL REFRIGERATING MACHINES supplied and installed by J. & E. Hall for the Harrow (Middlesex) Works of Kodak Ltd. They are used for controlling temperature and humidity during the processing of their products. With a total b.h.p. of 2875, the machines have an output of 21,600,000 B.t.u./h—equivalent to 1,800 tons of refrigeration!

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AP 378

SHOP REFRIGERATION NEWS

There is Change —but Fewer (and Better) Retailers Mean Greater Prospects for Refrigeration

By Our Special Correspondent

HAVE you noticed the headlines in the food trade journals lately ? If so, you will have become conscious of the frequent recurrence of such words as " conversion," " expansion," " acquire," and of " super- " this or that : all indicating the ever-increasing trend to large-scale operation of food retailing.

Supermarkets are now opening at the rate of at least three a week. All the large multiple companies and existing supermarket companies have ambitious programmes of development, and most of them buy refrigeration storage and display equipment from one or another of the half dozen (or even fewer) manufacturers bearing famous names.

Assuming that this giant-scale retailing will continue to expand at a similar rate, and that its operators will continue to buy refrigeration equipment on the same principle, for at least another decade, what is likely to be the impact upon the smaller producers in the refrigeration industry ? Will they diminish in number as the small individually-owned retail food shops are diminishing ?

Or, to put it in another way, will the advance of the giant self-service food stores so appreciably reduce the number of small specialist food shops that the scope for the sale of cabinets and cold rooms to individual retailers will shrink to negligible proportions ? And, if this comes about, will it mean a corresponding reduction in the number of refrigeration specialists selling cabinets and having, as a consequence, to turn to other kinds of business ?

The best way to attempt to answer these questions is to study the situation to-day in the individually-operated shops of the five specialized sections of the retail food trade :—

1. Cooked foods and delicatessen,
2. Fish and poultry,
3. Fruit and vegetables,
4. Meat,
5. Provisions,

all of which provide outlets for the sale of refrigerated equipment. I have excluded groceries because that class of merchandise does not require refrigeration ; though, of course, two of the specialized groups already mentioned—cooked foods/delicatessen and provisions—form an integrated part of many grocery businesses. This month I am concentrating on numbers 2 and 3.

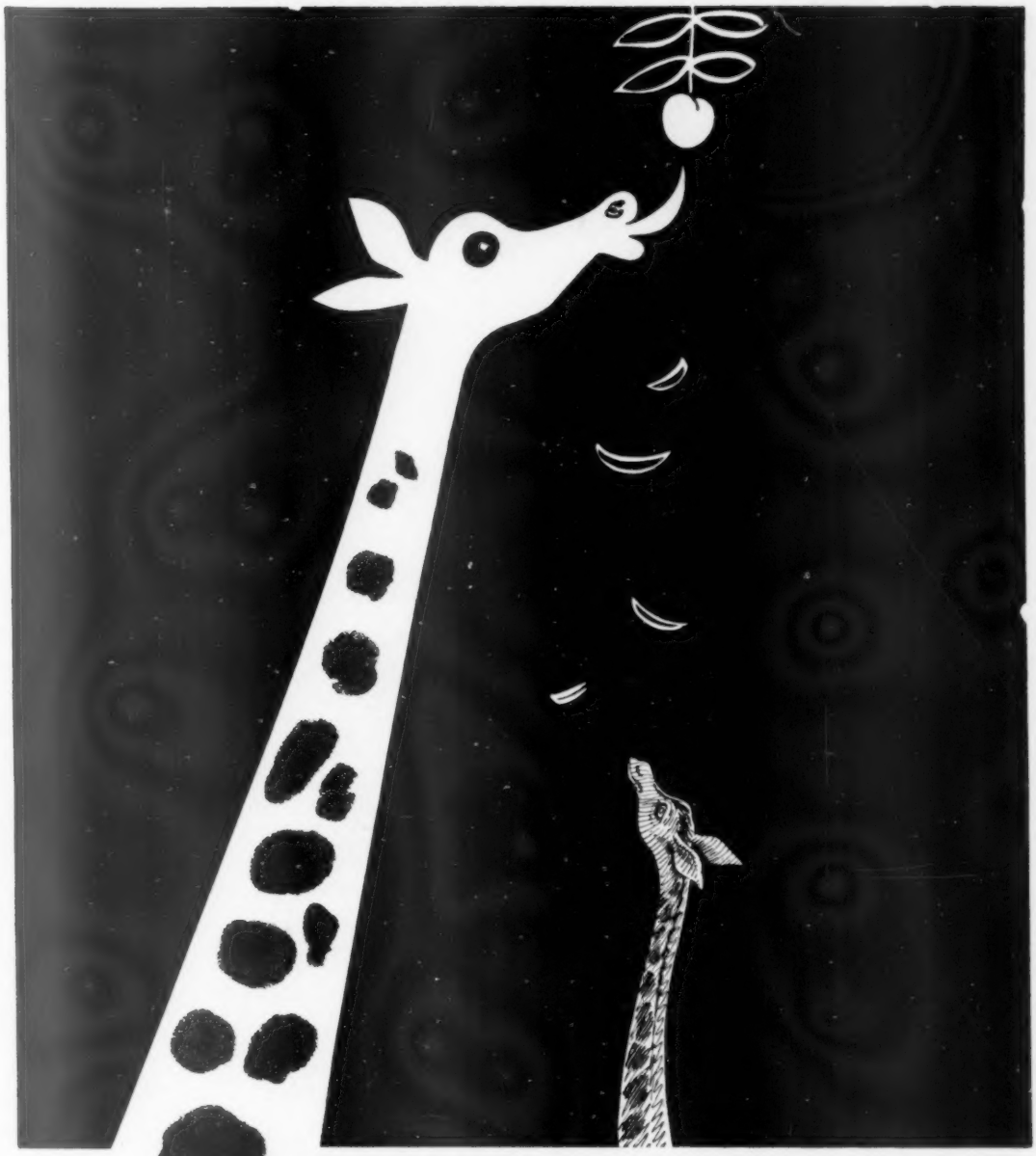
But, before studying the scope offered for the future sale of refrigeration equipment by these individual trades, it is important to get a sense of proportion and to realize that, although every big movement with potentialities for influencing public taste and habits inevitably receives a tremendous amount of publicity, only a proportion of that publicity is of enduring value.

This supermarket development *is* a big movement with the powerful drive of huge financial resources behind it. But magnitude is not a merit in itself, and magnetism has its limitations. There will always be people who dislike going to crowded places and who prefer the intimacy and friendliness of the smaller shops.

Every supermarket opened, with or without the aid of a big splash of local advertising, makes a stir in its locality and draws shoppers in from surrounding districts. But spacious and comprehensive as a supermarket may be, and alluring as the price-reductions of the discount store may become, there will always be the value of contrast. The people drawn to the shopping centre that is enlivened by the arrival of the supermarket are not normally content to confine their shopping within its three walls and plate-glass front. They still wish to have the benefit of competition and the opportunity to make comparisons in prices and quality. One supermarket in itself does not make a shopping centre, though it may increase the popularity of the shopping centre in which it is sited.

Fish and Poultry

Supermarkets do not sell wet or smoked fish from the slab, and the attempt to sell wet fish in ready-wrapped form on self-service principles has not proved successful. Pre-packaged wet fish has, in fact, proved to be a complete flop. Therefore, disregarding the competition of ready-wrapped and proprietary-branded quick-frozen fish (which the fishmonger has to face



Sometimes it pays to stick your neck out

The juiciest plums are at the top of the tree: perhaps you dream of reaching for them? But that means growing. And growing costs money. Money? Why, that's just what UDT is for. If it's time you added or replaced equipment: if it's time you modernised your production: if it's time you enlarged your premises: then it's time you came to us at UDT. Maybe we can help you to those juicier plums.

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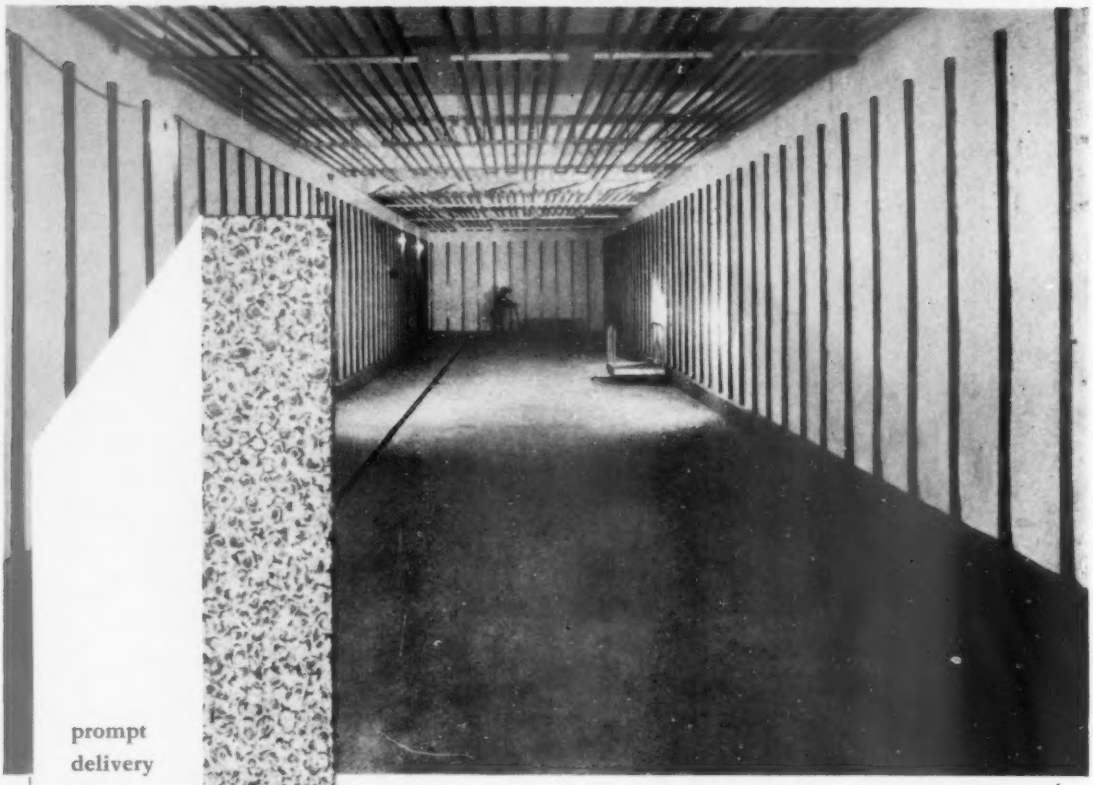

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"Multum in parvo" with three types of refrigeration. Below: The premises at Teddington described on this page.

from *all* kinds of food shops, not supermarkets only), it can be said that the development of supermarket trading has not affected the fishmonger and, *so long as he maintains a high standard of service and hygienic presentation under temperature-controlled conditions*, there is no reason why he need fear supermarket competition.

The steadily increasing consumption of quick-frozen fish in consumer packs will probably prevent any increase in the number of fishmongers' shops, and may, indeed, reduce them in number, for those that fail to improve their standards will almost inevitably go out of business. But the refrigeration industry will gain rather than lose by the operation of this "survival of the fittest" principle.

There is a supermarket a short distance away from the small fish shop shown in the first illustration, but the friendly personal trade with customers that are mainly of the regular type remains unaffected. This shop is, in fact, a model of its kind.

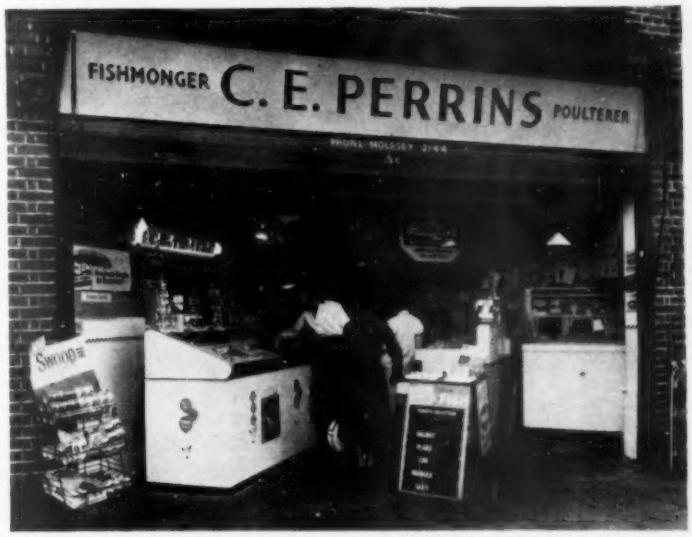
Although of quite small proportions (approximately 12 ft. square) it includes a refrigerated slab, a quick-frozen food cabinet, and a cold room. The slab, which takes up the full length of the window and continues back for 7 ft. into the shop, is an L shape, and easy access to all parts for service is provided from the inside of the L. It has a surface of white plastic-coated galvanised iron with refrigerant coils beneath. There are also coils in the risers at the back on the top of which are 7-in.-wide ledges for display and service.

The slab was designed and installed by Burnetts Refrigeration Services of Kingston-on-Thames. The refrigerating machinery (by Lec) is housed beneath the slab. On the right-hand side facing the door is a Frigidaire frozen-food cabinet installed by Trembath & Co. Ltd., and behind this cabinet is a reach-in cold store supplied by Electro-Rentals Ltd.

Another all-refrigerated fish shop, and an interesting contrast in lay-out, is that of Mr. C. E. Perrins, at 146, Stanley Road, Teddington, Middlesex. This open-fronted shop has a corridor-like main selling area, flanked by temperature-controlled displays, one of fish and the other of poultry, sausages, and sundry ready-wrapped products. These are both Winget counter tops and were supplied by Burnetts Refrigeration Services. The quick-frozen food cabinet (a Prestcold) is set back on the right-hand side to form as it were a little department of its own.

Fruit and Vegetables

This trade, although, as I mentioned last month, making extensive use of quick-frozen food cabinets, lags a long way behind its contemporaries so far as normal-temperature refrigeration is concerned. This is partly attributable to the fact that it is neglected by the sellers of refrigerated display equipment who take the line of least resistance and



A close-up view of the poultry cabinet in Mr. C. E. Perrins' shop.

concentrate on the selling of quick-frozen food cabinets because they find the fruiterer more responsive to the suggestion that this will make his shop more up to date or help him to meet the competition of the butcher, baker, confectioner, fishmonger, and grocer, who are all selling peas and other vegetables from their frozen-food cabinets.

Individual as well as multiple greengrocers are getting some competition from the supermarkets of every one of which, with rare exceptions, the fruit and vegetable section, although seldom refrigerated, is an essential and prominent feature.

Although there has been no appreciable diminution in the number of greengrocery shops that can be attributed to the steady advance of the supermarkets, this self-service sale of fruit and vegetables is a potentially formidable, though at present only niggling, form of competition. This arises primarily from the fact that it is easy for the supermarket shopper to pick up a polythene bag of potatoes or of fruit, vegetables or salads, in the course of her food shopping tour around the supermarket. But my own investigations have shown that the housewives who are prone to pick up sundry items of fruit or vegetables in the supermarket *still have their own greengrocer*, from whom they make regular and larger purchases.

The standard of many greengrocers' shops has improved of recent years, and here and there I have come across examples of the enterprising use of refrigeration, several of which I have mentioned in the shop refrigeration review during the last year or so.

Unlike butchers and fishmongers, greengrocers seldom make use of refrigerated window display, though it would be greatly to their advantage to do so. One rare example of the use of a refrigerated window, to which I referred, but did not illustrate, in the July issue of "M.R.", is shown in the fourth illustration. It is in the shop of Mr. and Mrs. Ninnim, on a housing estate at Cove, near Farnborough, in Hampshire. The base of this left-hand window of the shop is a Winget Cooltop, installed by Seldon & Co. Ltd., of Guildford and the fresh produce is displayed on removable grilles. Mr. and Mrs. Ninnim have found it a valuable means not only of increasing trade but also of avoiding waste.

Right: Greengroceries displayed under refrigeration—on removable grilles—one of the few such windows for this trade.

"DUAL-TEMP." CASE

The new dual temperature refrigerated display cabinet from Hussmann British Refrigeration Ltd., pioneers in this country of refrigerated display, has two top shelves for dairy produce at 38° to 42°F., and the lower and deeper compartment for frozen foods at 0°F. Because of its compactness this cabinet (which is 6 ft. in length) is ideally suited to smaller, self-service grocers where there is not sufficient floor space to house separate cases.

COMMERCIAL AND INDUSTRIAL SECTION

Manufacturers' and Distributors' News

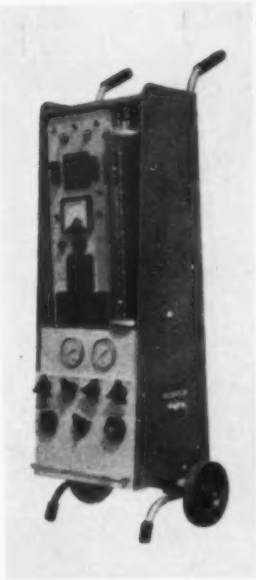
Continual expansion, and the birth of Teddington Autocontrols Ltd., the youngest member of the **Teddington Group of Companies,** Sunbury-on-Thames, Middlesex, has of recent years been providing a space problem which has now been overcome by the erection of a modern factory building of over 33,500 sq. ft. on the Sunbury site. Assembly lines, planned to make full use of conveyor belts, are being installed for the mass production of domestic and commercial instruments of various types including gas and electric refrigerator thermostats, gas burners and cooker top-plate thermostatic controls. Emphasis was placed on providing comfortable working conditions as evidenced by the excellent lighting both natural and artificial, ventilation and space heating, and modern employee amenities.

* * *

"Profitable Poultry Refrigeration" is the title of a new publication by **York Shipley Ltd.,** North Circular Road, London, N.W.2. Illustrated with numerous application photographs, it deals with the cold storage of both fresh and frozen birds, poultry freezing by blast and immersion process, ice making and egg freezing.

* * *

J. W. Pickavant Ltd.'s P.8000 trolley can be lifted into a van or car by one person and wheeled into the house—upstairs if necessary. The serviceman is now able to carry out all electric checks, break into a sealed unit, repair, evacuate and recharge on the spot. No need for separate pieces of equipment ; the trolley even includes various types of popular plug sockets so that no time is wasted connecting the appliance for electric checks. The charging trolley is smart in appearance and can provide the service customers expect. Full operating instructions are issued with each trolley.



Measurements are : Height, 3 ft. 9 in. o/a. ; width, 1 ft. 6 in. ; depth, 1 ft. 6 in. o/a. ; weight, 93 lb. approx. (42 kgm. approx.).

More space at Sunbury.

Our illustration shows Mr. H. Fletcher Wood, managing director of Windsor Refrigeration Distributors Ltd., being inducted as Mayor of Maidenhead.

* * *

Palatial G.K.N. H.Q.—The new premises of Guest, Keen & Nettlefolds Ltd., G.K.N. House, at 22, Kingsway, London, W.C.2 (CHAncery 1616) on the site of the former Stoll Theatre, comprises eight floors of 92,100 sq. ft. The layout and equipment are of an exceptionally high order of design and manufacture.

RANCO IN MOSCOW

The photograph at right is of the Ranco Ltd. stand at the recent British Trade Fair in Moscow. On show was a comprehensive range of controls for heating, refrigeration and air-conditioning together with relays and fractional horse-power motors for hermetic compressors. The two working models in the right foreground and centre background show Ranco control systems for heat pump air-conditioners, and reverse cycle defrosting, respectively. In line with the emphasis on commercial and industrial refrigeration in the U.S.S.R. they were the main objects of interest for Soviet designers and refrigeration engineers. For the general public an English Electric refrigerator (using a Ranco thermostat and a Sterne compressor) was a tremendous attraction.

Mann Egerton's have marketed for many years now a standard range of containers. The latest models incorporate several important and interesting improvements in design. One feature is provision for Thermo King mechanical refrigeration equipment. By means of a special panel the appropriate Thermo King model can be fitted either when the container is new or on any subsequent date. Yet another novel feature are the steps fitted to the exterior of the body which, used with the small portable platform provided, enables maintenance and adjustments to the Thermo King unit to be carried out easily and comfortably. The container shown is 14 ft. long, panelled internally with aluminium alloy and externally with mild steel. The insulating material is 4 in.-thick polystyrene. When in operation, it will be used for the transport of frozen foods at a maintained temperature of -5° F. By virtue of the wide range of units available a large range of goods can be carried in vehicles operating a Thermo King unit : meat, fish, poultry at the higher temperatures, down to -10° F. for ice cream. All units include automatic defrosting.

Sesame opened

Sometimes in the middle of the night, chaps get urges for ice lollies.
And there they are—just a creep-down-the-stairs away, sitting, frosty, in the chiller.
An Aladdin's cave of cold pure plastic—Shell's 'Carinex' polystyrene.
There are grades for moulding escutcheons, trays,
boxes and one for sheet extrusion.
Strong and rigid, it is available in any colour
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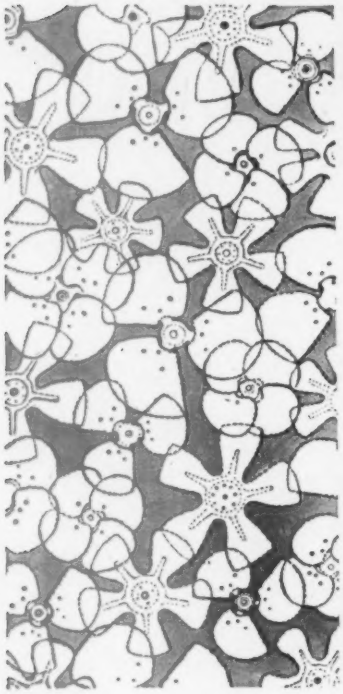
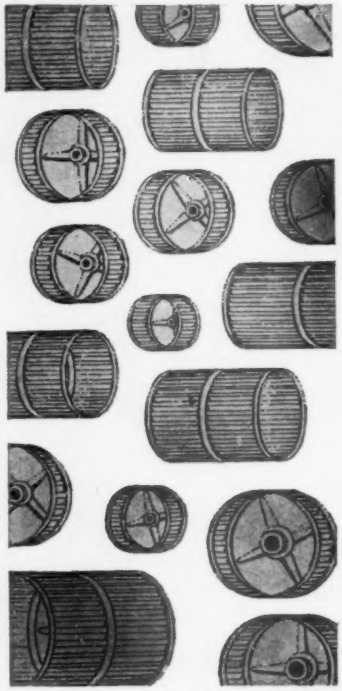
IN THE COUNTRY



AIROTORS?
YES, SIR
BIGGEST RANGE
IN THE COUNTRY



BOFFINS?
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The world-famous TORRINGTON air-impellers are now made and sold by SMITHS.
SMITHS offer the widest range of airotors and propeller fans in this country, and can assemble and deliver promptly from a wide range of tooled stock components. SMITHS Technical Advisory Service puts at your disposal the unrivalled knowledge and experience of both great organisations.

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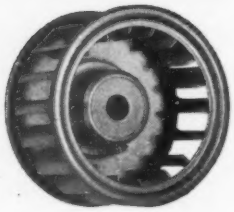
PROPELLER FANS
From 3″ to 24″ diameter, either rotation, in a variety of pitches. Light, rigid, quiet, efficient.



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COVENTRY'S NEWEST SUPERMARKET

"IN keeping with its turbulent past and its hectic, mass-production present, Coventry's reconstruction today is a vital process, from its controversial new cathedral to its new motor roads and pedestrian-only precincts. Here, too, stand the supermarkets—symbol of the age in retailing—and newest of them all is that of the Maypole Dairy Co. Ltd., on Shelton Square, where pedestrians may linger unmolested by motor vehicles." states *Frigidaire News*.

"This is an area where new shop centre techniques are to be found and the new Maypole building has the unusual feature of two pedestrian levels, one on the normal pavement and another at first floor height, connecting with adjacent buildings. (We can't help thinking someone must have written the same 400 years ago, referring to the then new

shops in Chester ! Well, they say there's nothing new under the sun . . .) To cap it all, car parking is on the roof.

" Through the plate glass which makes up two sides of the new supermarket, one can see the long runs of Frigidaire display cases which flank the other two walls. Over 100 ft. of Frigidaire cases have been supplied for this new Maypole, and two cold-rooms are also fitted for storage of dairy produce and fresh meat.

" The meat is sold in two forms, firstly in pre-packed portions in a 16 ft. run of three-tiered Superamas located in the main run of refrigerated display, and secondly in the butchery department, where unwrapped cuts are displayed in a 14 ft. 5 in. Manhattan outline case with special adaptations. This case is specially fitted with a high-glass riser, so that it is no longer a self-service case, but a self-selection case. It is cooled by rear-mounted bunker evaporators with low temperature difference between refrigerant and display area, to ensure a gentle gravity air circulation with ideal humidity conditions and no tendency to dehydration.

" Similarly adapted Manhattans are employed in the 18 ft. 6 in. run of cases for delicatessen and unwrapped bacon, and in this instance an extra glass shelf has been fitted inside the riser to help the assistant in service. A scale platform has also been fitted.

" Superamas are fitted in two 14 ft. 5 in. runs for display of dairy produce and pre-wrapped bacon, and for frozen foods there is a 12 ft. Manhattan case joined to the pre-packed meat Superamas and matching these in outline. The butchery department employs an 8 ft. Manhattan case for displaying frozen chickens.

" The total area of the sales floor is 4,000 sq. ft. and the Frigidaire display cases constitute a most attractive background, along one long wall and the far end. The Superamas and Manhattan on the long wall are finished in a formica ' brick-bat ' pattern of sky blue, suntone yellow tone grey and mid-green. The bunker-cooled Manhattans and the frozen chicken case are in Formica ' amulet green.'

" Installation was carried out on behalf of Frigidaire by Wathes (Western) Ltd."

NEED FOR RESEARCH BY SCOTTISH INDUSTRY

In an article published in the *Times Weekly Review*, Sir Harry Melville, K.C.B., F.R.S., secretary of the Department of Scientific and Industrial Research, expresses his disappointment at the small use being made by Scottish industry of the research facilities available in government laboratories. Sir Harry refers, in particular, to the National Engineering Laboratory at East Kilbride, near Glasgow, where less than 200 of a total 3,000 requests for research reports in 1960 were from Scottish firms. In addition, less than 5 per cent. of the N.E.L. receipts for work done were from Scotland, and the largest single job cost only £350. Sir Harry says he is particularly disappointed " that these magnificent facilities are used so little by Scottish industry and so much less than we had hoped. If the reason is lack of knowledge then I doubly welcome this opportunity to make them known more fully."

MEETINGS IN SPAIN

The Experimental Centre for Refrigeration, belonging to the High Council of Scientific Research, will hold its 4th general assembly at Valencia, from November 6 to 11, 1961, under the sponsorship of the National Fruit and Horticultural Produce Syndicate.

In compliance with the statutes of the centre, all its members will participate in this general assembly, during which they will be informed on the work carried out by the centre. All the papers presented will be discussed at congress level. The board of the assembly will be composed of the members of the technical administrative council of the Centre.

Valencia has been selected as the scene of this assembly because it appeared to be most worthwhile to discuss there all the problems derived from the application of refrigeration to vegetable products, which make up the main resources of the Spanish Levant, and especially of the Valencian country.

A series of technical visits to the most important refrigerating plants in Valencia will be arranged, as well as a programme in honour of the participants and guests accompanying them.

All inquiries must be addressed to : Secretaria de la IV Asamblea General del Centro Experimental Del Frio, Serrano, 150, Madrid 6. Phone : 259 36 48.

An entirely new type of blowpipe is now available which by a simple change of nozzle can be converted from a cutting torch into a welding torch. Claimed to be the only torch of its type available in Britain, it does not require any conversion at the bottom of the shank. In addition, back-firing has been eliminated. Called the Double-duty Demon, it weighs only 1¼ lb., and is simple to manipulate. It will cut sheet metal and steel plate up to 2 in. thick, and can weld steel up to ¼ in. thickness. The handle to the torch has been specially designed and constructed being of non-metallic composition with a non-slip fluted grip. The torch is supplied with three welding and two cutting nozzles which will handle most of the requirements of everyday welding and cutting. The new blowpipe is marketed by **Suffolk Iron Foundry (1920) Ltd.**

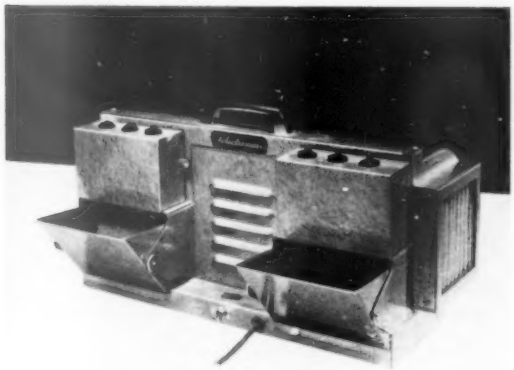
* * *

The **Heston** box-type aluminium container is a pallet to which sides and a lid may be securely attached in a matter of seconds. Hinge lips enable the sides to engage each other, these are then attached to the base and swung up into position. The top is next hinged to one of the sides and latched down. No tools are required for assembly. When the top is clipped down the container is completely fastened and no other method of securing is required.

"SELECTRONAIR"

NOVEL TYPE AIR-PURIFYING DEVICE

SHELTON Metal Production Company in the United States has recently developed an entirely new type air-purifying instrument, called "Selectronair." The new instrument strains particles as small as 39/1,000,000 of an inch from the air. Air-purifying capacity of "Selectronair" comes from the flow power it develops; also from six powerful germi-



cidal, ultra-violet lamps. Air velocity through the machine is 2,000 ft. per minute and the lamps kill bacteria as high-velocity air moves through twin filters, which can be removed for washing.

The "Selectronair" unit can be carried by an individual from room to room, and can be installed in a window in less than sixty seconds. The lightweight, portable instrument has the following features:—

A removable filter which can be seen when dirty and can be readily washed in seconds. (A concealed filter is generally a dirty filter.) It also has germicidal lamps, as deferentiated from ozone lamps, which kill substantial amount of bacteria. Lamps are interchangeable to accomplish desired results.

Filters of "Selectronair" filter down to one micron, the airborne material that can only be seen under a most powerful microscope. It is equivalent to the dust that causes one to sneeze from pepper, and cannot be seen in the air. Equipped with chutes, the air from the instrument can be directed to the furthermost corners of a room, to the ceiling or to the floor, under beds and furnitures, doing a real job of removing all airborne organic matter, dog fur, lint, pollen and other airborne allergy producing substances. "Selectronair" provides velocities up to 2,000 ft. per minute, which means that the air in the room will be conditioned and changed very quickly, providing 120 c.ft. of air per minute. This means that the cubic contents of a room can be forced through the filters extremely fast.

H.E.V.A.C.

The First International Heating, Ventilating and Air Conditioning Exhibition is to be held at Olympia, London, from Tuesday, September 26 until October 6, 1961, inclusive. The hours of admission are 10 a.m. to 6 p.m. daily, except Thursday, September 28 and Wednesday, October 4, when the exhibition will be open until 9 p.m. On Friday, October 6, the exhibition will close at 4 p.m.

The HEVAC Exhibition is organised by Industrial Exhibitions Limited, and promoted by an advisory committee from the industry. It is sponsored by The Institution of Heating & Ventilating Engineers.

During the period of the exhibition there will be an International Conference on Heating, Ventilating and Air-Conditioning organized by The Institution of Heating & Ventilating Engineers from September 27 until October 4.

Air-Conditioning for Operating Theatres

RECENT reports in the medical and national press have spotlighted the demands made by many surgeons for refrigerated air-conditioning to improve conditions in British hospital operating theatres.

Air-conditioning is still relatively new to this country, and although most mechanical engineers have a working knowledge of the subject, its use is still not really widespread, particularly in our hospitals.

To-day, the control of indoor temperature and humidity is used extensively throughout the world, in industry, business and in the home, not only to provide comfortable and healthful conditions, but also to reduce losses in manpower, time and efficiency. There are many examples abroad of fully air-conditioned hospitals, as will have been witnessed by members of the Hospitals Study Group who visited America at the end of last year.

What is Air-conditioning?

Interest in air-conditioning has been growing in Great Britain and current trends suggest that the industry is on the brink of much more general acceptance. Over the last year or two the selection of equipment being offered on the British market has expanded rapidly, with the formation of several new marketing and manufacturing companies. One such company, Carlyle Air Conditioning and Refrigeration Limited, London, who manufacture a wide range of

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packaged and central station air-conditioning systems, have brought to this country the experience and know-how of the largest manufacturer of air-conditioning equipment in the world.

To provide a clear picture of what is involved it is first necessary to clarify the meaning of the term "air-conditioning."

Air-conditioning is either cooling or heating with temperature and humidity under control. It is cleaning and circulation of air. It is ventilation. Ideally air-conditioning is all of these—simultaneously. In fact, true air-conditioning will create an atmosphere in which people can work normally, without the stresses that are imposed by natural and mechanical variations in the climate. Apart from the obvious need for temperature and humidity control in hot countries, air-conditioning is most profitably applied to buildings and departments which have high densities of people, lighting and electrical equipment.

It is generally accepted that the main departments of an operating theatre suite should be provided with some means of heating and mechanical ventilation. However, official circles are not yet generally persuaded of the desirability for the inclusion of refrigeration plant in the system. It is suggested that the expense of a refrigeration unit can be hardly justified in a country such as Great Britain, which is geographically situated in a temperate zone. We will return to the question of cost later, but first let us look at the utilization an air-conditioning system will receive in this country.

Why should there be a need for refrigerated air-conditioning in a temperate climate?

A simple demonstration will help to illustrate the reasoning behind demands for this equipment in operating theatres. The ideal temperature condition for operating theatres is recognized to be about 70°F. In an average suite there are sufficient sources of heat gain through lights, equipment and people to raise the normal temperatures by about 10°F. This means that outside air entering the un-refrigerated ventilating system, will have to be at 60°F. or below to maintain a condition of 70°F. in the theatre. In the London area during 1960, a temperature of 60°F. and above was recorded on 155 separate days. Therefore, on 155 days or 44 per cent. of the year refrigerated air-conditioning should have been used to maintain proper and acceptable conditions.

In this case, what is justifiable expense and what is not? If the patient, who after all is the most important person in the theatre, is being operated on under conditions which are agreed to be less than ideal from the standpoint of the surgeon and his staff, who is to put a value on the equipment needed to correct this position?

Purpose of Air-conditioning

The effect of the application of air-conditioning is to minimize the discomfort and nervous strain on the theatre staff and the patient and to create and maintain a "clean atmosphere" which will prevent the operating wound being subjected to the risks of airborne infection. Anaesthetic gases are explosive, so one must maintain a fairly high level of relative humidity (55 to 60 per cent.) to eliminate the possibility of electrostatic sparking—an ever present hazard in operating theatres.

Surgical operations are becoming far more complex and may last for many hours, imposing a tremendous strain on the surgeon. For the safety of the patient the surgeon must remain absolutely fresh, both mentally and physically from beginning to end. This can hardly be achieved in a hot oppressive atmosphere, which is not eased by the restricting garments the operating staff wear. In many cases it is necessary for one or more of the nurses to keep swabbing the perspiration from the surgeons' faces and hands as it is absolutely vital that this should not be allowed to penetrate an open wound. In many cases an extra nurse is required for this duty which adds to the cost of maintaining the hospital.

Surgeons are not remaining silent and many have come forward publically to air their opinions.

In *The Lancet* on December 17, 1960, Reginald S. Murley, senior surgeon at St. Albans Hospital, expressed the view of fellow surgeons concerning the absence of full air-conditioning at their hospital in a letter that concluded:—

"Before the installation of the St. Albans plant, and acting on the advice of an independent consulting ventilation engineer, our surgical staff clearly warned the regional hospital board and the Ministry of Health of the inevitable consequences of their action. Despite that warning and repeated requests that the plant should be modified, no effective action has been taken. If the Ministry of Health is waiting for more convincing factual evidence in the form of a corpse of a patient dead from heatstroke, then it seems possible that we may have to wait until next summer to provide it."

Refrigeration is one of the most important items in any air-conditioning system, since it provides the medium for cooling and dehumidification. But the cost of providing this valuable medium is thought by the Ministry of Health to be prohibitive. To quote from the *Hospital Building Bulletin* on operating theatre suites:—

"A refrigeration plant for a suite of two theatres is unlikely to cost less than £6,000. . . ."

This figure, in the light of present day development, is quite unrealistic. The introduction into the British market of packaged air-conditioning equipment by several companies, including Carlyle, has brought a completely new complexion to the industry.

The packaging of component parts into one unit has been developed by the air-conditioning industry in America over the last 30 years. The principle is to manufacture a series of standard units in a range of different sizes, each completely self-contained. The load for any particular application is sized by an engineer who then specifies the nearest standard unit in size, to meet requirements. Depending on the output needed, the units are installed either singly or in multiples.

Mr. R. S. Reynolds, managing director of one of the leading British air-conditioning companies, and one of the few men in top management who has had a great deal of first-hand experience of this type of

installation in many different countries, recently commented on the situation in Britain.

Said Mr. Reynolds: "When you consider that the National Health Service is the envy of most nations in the world, it is extraordinary that there should be any dissension over the use of full and complete air-conditioning, particularly when the very countries which admire our own service follow the practice extensively. If air-conditioning is a luxury, then it suggests that the operating theatre is also considered to be a luxury, which can hardly be the case."

The advantages of the packaged system over the central station plant, for the smaller type of installation, are soon obvious.

A central system is designed specifically for one installation. The plant can be field or factory assembled, and each of the functional components is separately selected for duty and capacity and individually erected in a central plant room.

Clearly the saving both in first cost and installation expense of the packaged unit, made on mass production lines under close factory supervision, is considerable and enables the demand for air-conditioning to be extended over a much broader base, both in specialized applications such as hospital operating theatres and more generally as in restaurants, stores and supermarkets.

Mobile Manufacturing Soft Ice Cream Plants

THE new ice cream craze, "instant" ice cream, is catching on fast, all over Britain. This type of ice cream is soft and fluffy, and unlike the stored block ice cream it is individually made-to-order every time anyone asks for sixpennyworth. From liquid mixture to mouth-watering confection is the work of only seconds : but the machinery needed to achieve this has been the subject of careful design and manufacture.

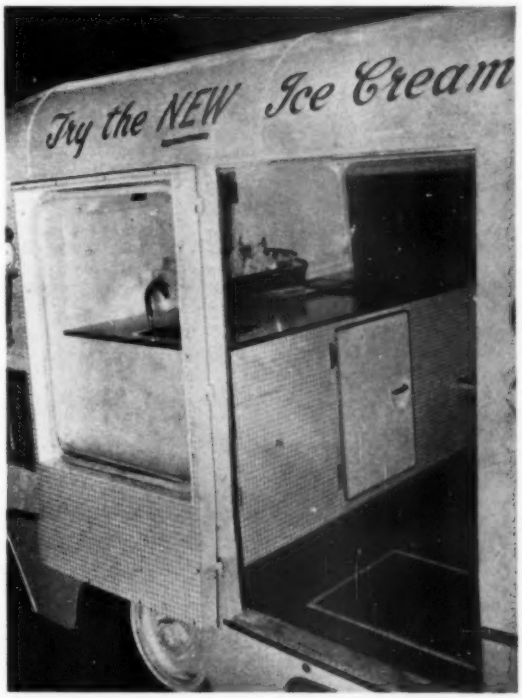
Ingenious planning and clever design have enabled all this plant to be installed in 30 cwt. vans and the latest batch of 250 have just been completed by Electrofreeze (Southampton) Ltd. for "Mr. Whippy Soft Freeze Ltd." of Leamington Spa. Electrofreeze are now well into the second 250-vans order and "Mr. Whippy" ice cream will soon be available all over Britain and Northern Ireland. Eventually these vans will also be patrolling streets on the Continent.

Costing approximately £3,000 each, these vans are one-man operated and the power, freezing and manufacturing equipment includes a 12·5 Kva petrol/TVO Elcctrofreeze generating set, two 1½ h.p. Prestcold condensing units, a ½ h.p. Sterne condensing unit operating a chill and deep-freeze cabinet designed and built by Drake's of Bournemouth, Carpigiani twin-barrel soft ice cream machine, and an automatic control panel in the driver's cabin which operates all circuits.

These special vans have been designed by Electrofreeze Ltd., who are also responsible for the modification specifications for the Ford Consul and Prefect engines used in the power plants. They also designed a special mobile version of the Carpigiani machine for these vehicles, and insisted that a high standard of cleanliness and hygiene be achieved by using Warerite decorative laminated plastics for lining the interiors. This is a special-order blue check pattern Warerite which lends itself ideally to the project ; firstly looking bright and sparkling at all times and secondly—and most importantly in a one-man undertaking—being easily and quickly cleaned by wiping with a damp cloth. Side walls, bulkheads, cabinets and doors, working surfaces and the main door of the vehicles have all been faced with this material and constant cleanliness is further ensured by a supply of hot and cold water for the use of the van man.

The Warerite veneers used by Drake's to face their "Golden Hind" deep freeze units were supplied by Channel Plastics Ltd., of Bristol.

These "Mr. Whippy" vans were featured in a story published in *The People*, issue dated July 9,where national emergency uses were proposed for these vans. These proposals are based on the facts that the vans are completely mobile, and distributed throughout Britain. They can be used : for generating lighting and heating power ; for deep-freezing units for the storage of blood plasma ; for the supply of boiling, and ice-cold water and, as emergency operating theatres. The feasibility of this scheme will readily be appreciated because, although the first three items may well be temporarily provided by other methods, surgical work demands the highest possible standards of hygienic surrounds. As complete major operating suites for hospitals are now panelled and ceilinged entirely in Warerite, these vans, which are similarly panelled, would be of paramount importance in a national emergency.



New "soft ice cream" vans, completely self-contained. Picture shows a close-up of the "Golden Hind" deep-freeze unit, by Drakes of Bournemouth, and the blue check Warerite panelling.

"SPANDOFOAM" INSULANT

AS a result of the article published in the July issue of this journal entitled "New Urethane Insulation" by A. Hegarty in which a product "Expandofoam" is mentioned, there is a probability of confusion arising between this product and the rigid polyurethane foams offered by the Baxenden Chemical Co. Ltd., under the registered trade name of "Spandofoam." In view of the similarity of the products, and the trade names, the Baxenden Chemical Co. Ltd., wish to draw attention to the fact that there is no connection or trading arrangement between themselves and any of the companies mentioned in the article.

The Baxenden Chemical Co. Ltd., are, of course, specialists in the manufacture of foamed plastics and have been marketing rigid polyurethanes for five years. The materials are being used in a wide variety of industries and the following information covers some of the products which they offer :

Clocel PE–2

K value initially 0·11, after ageing 0·145 B.t.u. per hr. per sq. ft. per °F. per in. A rigid polyurethane foam system consisting of two components, "A" and "B." "A" component is a partial prepolymer, "B" component is a resin together with "Freon" and catalyst. These materials are easy to handle, can be batch or machine mixed, and are not affected by temperatures as is the case with some "one-shot" systems. Foams produced from these ingredients have excellent low thermal conductivities combined with high strength and low densities. After being marketed for three years the material has fully lived up to its expectations.

Properties

Density, lb. per c.ft.	2·1
Tensile, p.s.i.	44·0
Elongation per cent.	3·8
Compressive yield strength, p.s.i. ... ... (Yield point at 9 per cent deflection).	43·4
Elastic modulus in compression, p.s.i. ...	480
Heat distortion temperature	110° C.
Closed cell content—per cent.	90
Water absorption : 6 in. cube—. 4 ft. head for 14 days per cent. vol/vol. ...	1·0
Moisture vapour transmission (38° C., 1 to 90 per cent. R.H. gradient)	
Sample, all cut surfaces ... ... (perms per in. thickness)	3·5
Sample, with moulded skin ... ... (perms per in. thickness).	1·4

Spandofoam 200

A rigid polyurethane sold in sheet form of nominal density 2 lb. per c.ft. "Freon" blown with properties identical to those detailed for Clocel PE–2 above.

Spandofoam 400W

This series of foam formulations of two components are offered with slight variations in order to give the customers a choice of densities ranging from 4 to 25 lb. per c.ft.

In addition to the liquid ingredients for customers' mouldings, sheet material is offered in densities 4 to 6 lb. per c.ft., and 400W are of particular interest for their structural properties.

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The Baxenden Chemical Co. Ltd., are also agents for the Newton foam machine for the dispensing and metering of all types of polyurethane foams, both rigid and flexible, and for the Graco Hydra Cat machine for the airless atomisation of polyurethane foams. Both these units are offered with full engineering service and indeed all the products of the company are backed by a superior technical service capable of dealing with a wide range of end uses.

PROPERTIES OF SPANDOFOAM PE.400 SERIES

Mechanical and Thermal	4±0·5	6±0·5	8±0·5	10±0/5	12±0·5	15±0·5	18±0·5	20±0·5	22±0·5	24±0·5
Density lb. per c.ft.										
Closed cell content per cent. minimum	95	95	95	95	95	95	95	95	95	95
*Compressive field strength p.s.i. (A.S.T.M.D. 695–54)	85–100	140–150	250–280	400–450	475–525	600–650	1,125–1,175	1,475–1,525	1,575–1,625	1,900–1,950
*Compressive yield strain per cent	7	7	13	11	8	7	——	19	20	16
*Compression strength p.s.i. (0·2 per cent. offset) ...							890–905	1,020–1,096	1,117–1,303	
Water absorption, no head, 7 days at 75°F, lb per sq. ft. ...	0·09	0·06	0·05	0·06	0·06	0·05	0·05	0·04	0·03	0·03
"K" factor at 75°F mean B.t.u. per in. per hr. sq. ft. °F ...	0·22	0·23	0·24	0·24	0·27	0·28	0·29	0·30	0·32	0·33

*Rate of compression 0·1 in per minute.

Electrical	Dielectric Constant*		Loss Tangent*	
Density (lb. per c.ft.)	Vert.	Horiz.	Vert.	Horiz.
6	1·11	1·11	0·0027	0·0027
12	1·26	1·25	0·0047	0·0046
16	1·35	1·35	0·0063	0·0060
22	1·51	1·49	0·0078	0·0076

* Results run at 100 megacycles.

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The dictionary comprises two main parts:
The first part includes all the index numbers classified methodically, each of them identified by means of a numerical index, and related to the six above-mentioned languages.
The second part includes a series of six alphabetical indices, one for each language, referring to the classified arrangement of the first part.

Expected release is for the end of September this year.

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PATENTS

APPLICATIONS RECEIVED

June 19—De Havilland Aircraft Co. Ltd., Wheeler, L. J. P22130, 22131, 22132, Thermoelectric cooler unit ; Stal Refrigeration A.B., C22092, Means for controlling capacity regulation of multi-cylinder reciprocating compressors. 20—English Electric Co., Ltd., Moores, H., P22233, Thermoelectric devices ; Kattis, T., C22224, Ice making machine. 22—Hussmann Refrigerator Co. C22616, Refrigeration system. 23—Denisoff, A. C., P22838, Refrigerated milk storage tanks. 24—Porter & Co. (Salford) Ltd., T. Porter, T., P22925, Cooling apparatus. 27—Sandor, J. P23246, Air-conditioning apparatus. 29—McQuay, Inc.,.C23533, Machine for making ice in flake form. 30—Brandon, C.W., C23817, Apparatus for refrigeration and heat transfer. July 3—Controls Co. of America, C23876, Defrost Controls. 6—Bearman, P. and Zetsche, J. F. H., P24397, Ozone unit for air-conditioning of motor vehicles. 8—Lec Refrigeration Ltd. and Turnbull, E. J., P24771, Gas compression apparatus. 10—Denco Miller Ltd. Miller, A. S., P24915, Refrigeration equipment ; Dole Refrigeration Co. C24948, Defrosting assemblies for refrigeration plates ; Sulzer Freres, S.A., C24958, Thermal insulation of components of low temperature plant.

COMPLETE SPECIFICATIONS ACCEPTED

July 12—General Electric Co., Ltd. 876,294, Manufacture of thermoelectric devices ; Connor Engineering Corporation, 876,402, Dual duct attenuators for air-conditioning systems ; Worthington Corporation, 876,257, Jet ejector lubricant return means for a refrigeration compressor ; Westinghouse Electric Corporation, 876,337, Thermoelectric devices. 19—Insulex Ltd., 876,779, Devices for reducing or increasing the temperature in containers ; Behr, M. (trading as Suddeutsche Kuhlerfabrik J. F. Behr). 876,548, Coolers in internal-combustion engines, air-conditioning plants, boiler induced draught installations, and the like. 26—Bodcher, H.F.V., 877,034, Refrigeration system ; General Electric Co., Ltd., 877,274, Refrigerators ; Sterne & Co. Ltd. L., and Spinney, P. M., 877,013, Refrigerating system for refrigerator-cars.

New Companies

The accompanying particulars of New Companies recently registered are taken from the Daily Register compiled by Messrs. Jordan and Sons Ltd.

Crowthorne Low Temperature Storage Co. Ltd., Preston House, High Street, Crowthorne, Berks. Secretary : C. G. White. Nominal Capital : £100. Directors : Geoffrey G. G. Walkington, 103, Redhatch Drive, Earley, Reading ; Roy H. Larby, Preston House, High Street, Crowthorne.

Proops Bros. (Stores) Ltd., 180, Aldersgate Street, E.C.1. Secretary : Samuel E. Proops. To carry on business of importers, exporters and factors of and dealers in and agents for television and radio apparatus and appliances, refrigerators, washing machines, et . Nominal capital : £100. Directors : Abraham F. Proops, 19, Marsh Lane, Stanmore, Middlesex ; Samuel E. Proops, 14, Marsh Lane, Stanmore, Middlesex.

J. Connor (Refrigeration) Ltd. Secretary : Dorothy M. Graeme. To carry on the business of refrigeration and air-conditioning engineers, etc. Nominal capital : £1,000. Directors : to be appointed by subscribers. Subscribers : Dorothy M. Graeme & Paul G. Graeme, both of 61, Fairview Avenue, Gillingham, Kent.

Chas. E. Price Ltd., 28, Market Street, Hoylake, Cheshire. To carry on the business of electrical and refrigeration engineers, etc. Nominal capital : £10,000. Directors : Charles E. Price and Muriel Price, 39, Queens Avenue, Meols.

Essex Insulations Ltd. To carry on business of manufacturers of and dealers in insulating and non-conducting materials, etc. Nominal capital : £1,000. Directors : Alan T. Hawkes, 96, Castleview Gardens, Ilford ; Wm. G. Willemberg, address not stated. Subscribers : John D. Martin, 19, Eversley Crescent, N.21 (clerk) ; Michael J. Culleton, 42, Heber Road, N.W.2 (clerk).

Midland Air Conditioning Ltd., 18–19, Ludgate Hill, Birmingham, 3. Nominal capital : £2,000. Directors : Walter D. Fisher, Inglewood, Welford-on-Avon, Stratford-on-Avon ; Raymond S. Smith, 23, Meadow Road, Alcester, Warwicks.

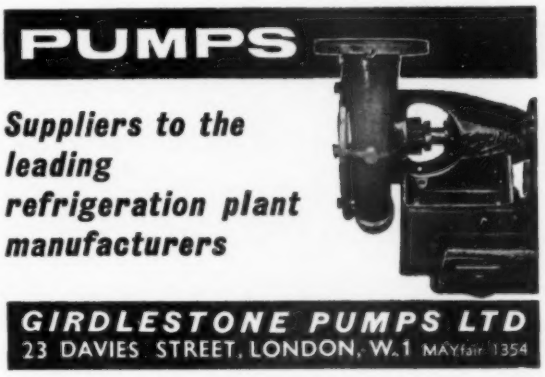
Mr. Whippy (Holdings) Ltd., 16, Warwick Street, Leamington Spa, Warwicks. Secretary : Stella P. J. Facchino. To acquire shares in Mr. Whippy (Soft Freeze) Ltd. ; Northern Dairies (Mix) Ltd. ; Mr. Whippy Ltd. ; Southern Soft Ice Cream Ltd. ; Electrofreeze (Southampton) Ltd. ; New Flavour Ice Cream Co. Ltd. ; Soft Ice Cream Co. Ltd. ; Tyne Ice Cream Co. Ltd. ; Partons Refrigeration Services Ltd. ; New Era Garages Ltd. ; and Frozen Fresh Ice Cream Co. Ltd., etc. Nominal capital : £100,000 in £1 shares. Directors : Dominic Facchino, 91, Northumberland Road, Leamington Spa ; Alec S. Horsley, Talbot Lodge, Woodfield Lane, Hessle, Yorks ; Anthony D. Bourne & George N. S. Horsley. Solicitors : Geoffrey Parker & Bourne, Stratford-on-Avon.

G. M. North Ltd., 29, Victoria Street, Grimsby. To carry on business of manufacturers and packers of and dealers in frozen foods, preserved and cooked foodstuffs, etc. Nominal capital : £300 in £1 shares. Directors : Geoffrey M. North, 2, Vaughan Avenue, Grimsby ; Ernest I. Reynard.

We learn that the directors of Link Refrigeration Co. (Grimsby) Ltd., 20, Heneage Road, Grimsby, are Mr. B. Crisp and Mr. E. Crisp, and not as stated in the official list under this section last month.

DRY AIR UNIT

A simple unit to provide a continuous supply of dry air down to –20° F. dewpoint at 70° F. is the basis of a recent design by W. S. Sharp, A.M.I.MECH.E., M.INST.R., technical director for Conditaire Limited, The Square, Knowle, Warwickshire, who have taken out the provisional patent. As there are no revolving or continuously-moving parts the unit should give many years trouble-free operation. The cost of the unit is approximately £1 per cubic foot of processed air. The standard unit delivers 1,750 c.ft. of air per minute and is capable of removing a maximum of 60 lb. of moisture per hour from air entering at 74° F. saturated. If the entering air is at 70° F. and 32° F. dewpoint the unit will remove nearly 30 lb. of moisture per hour.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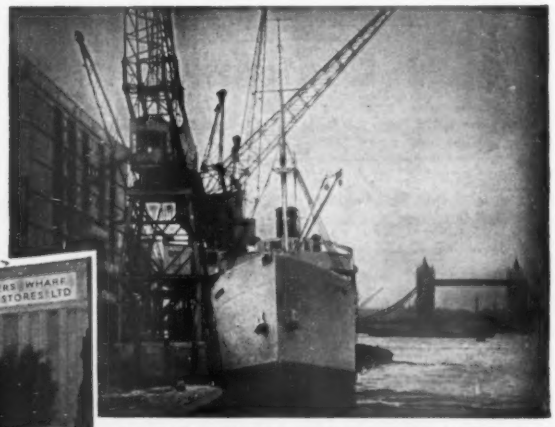

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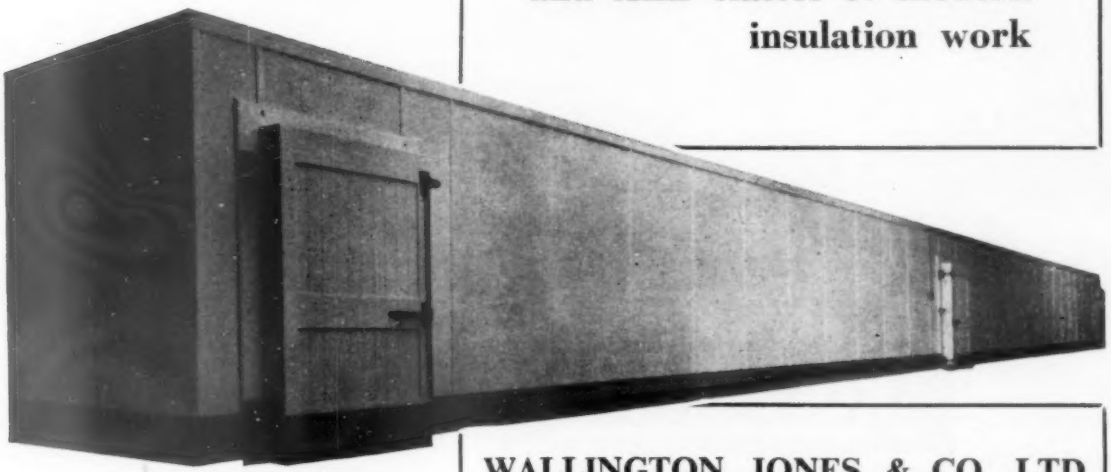

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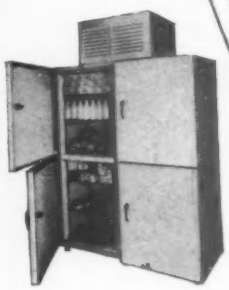

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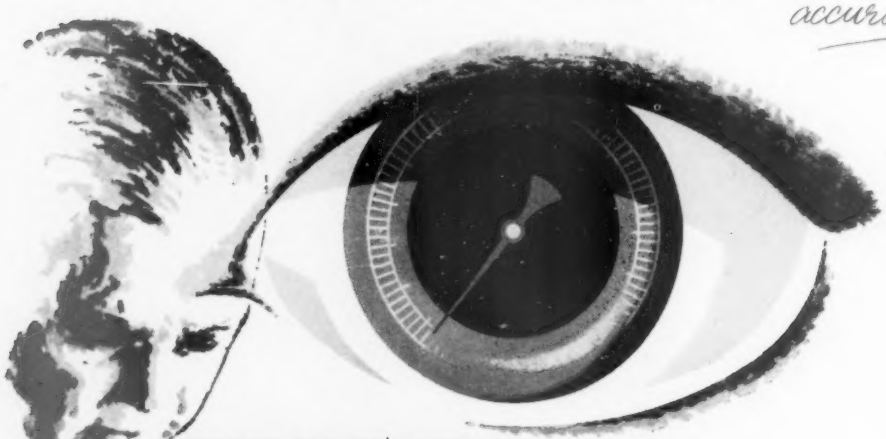

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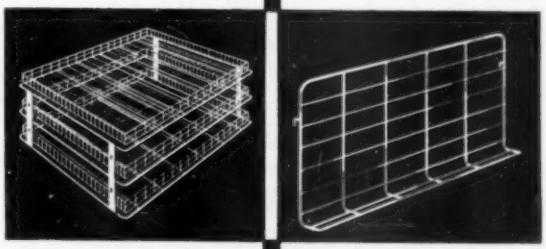

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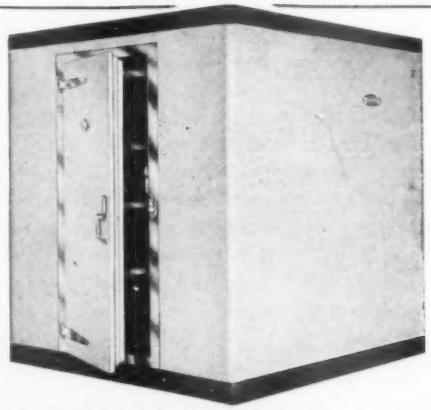

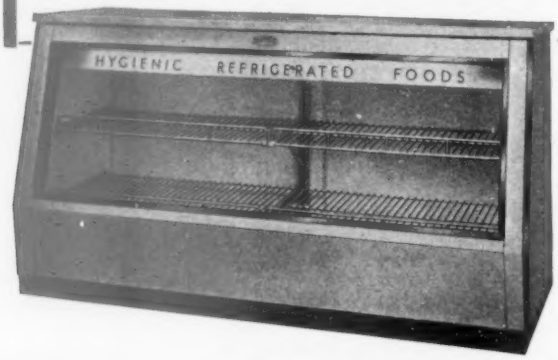

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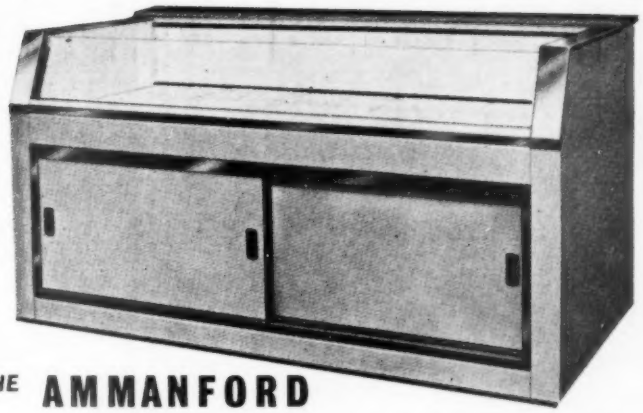

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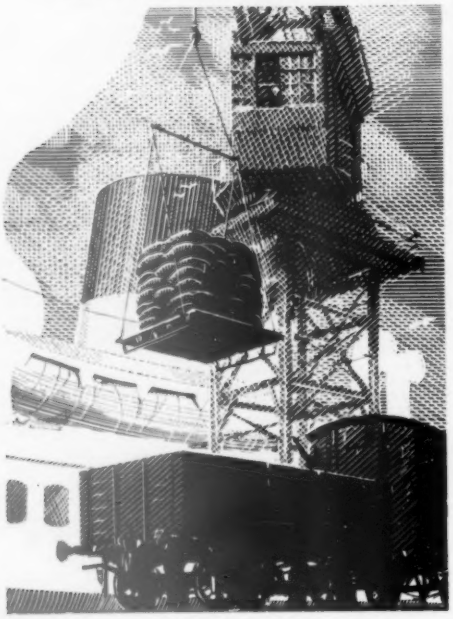

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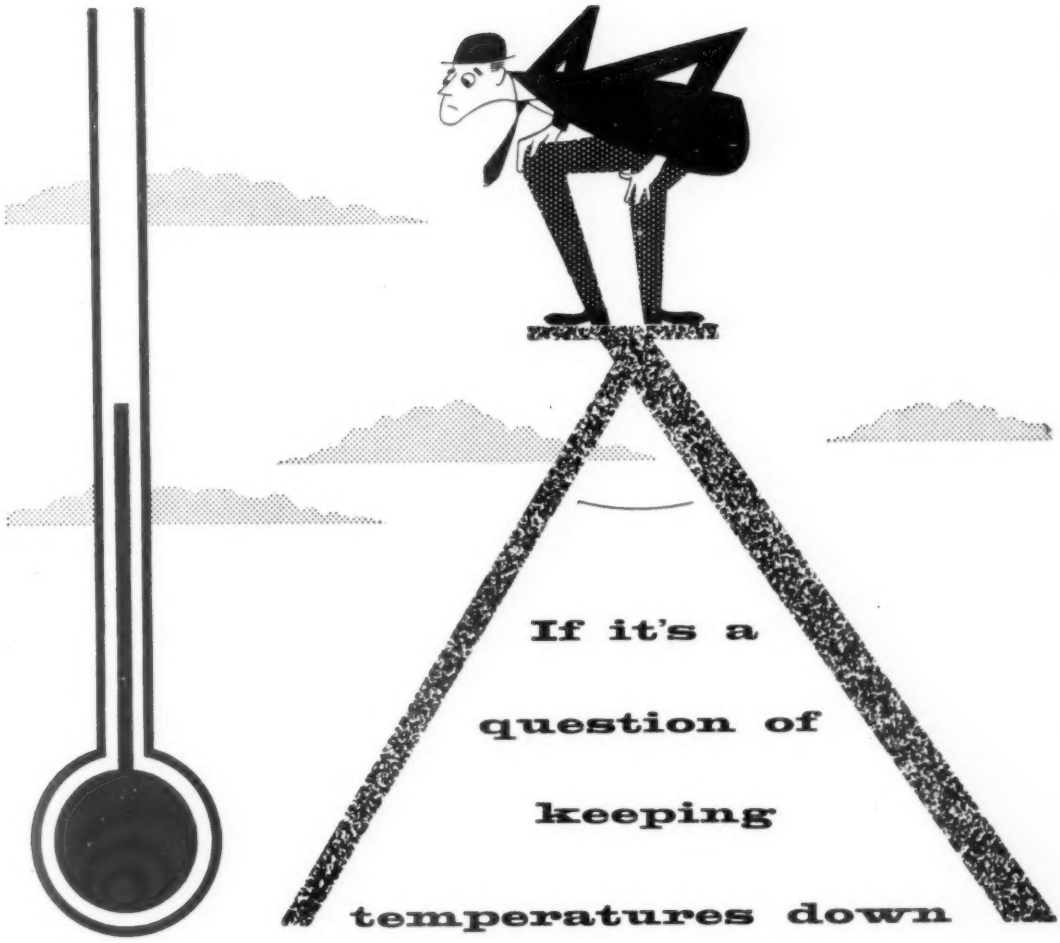

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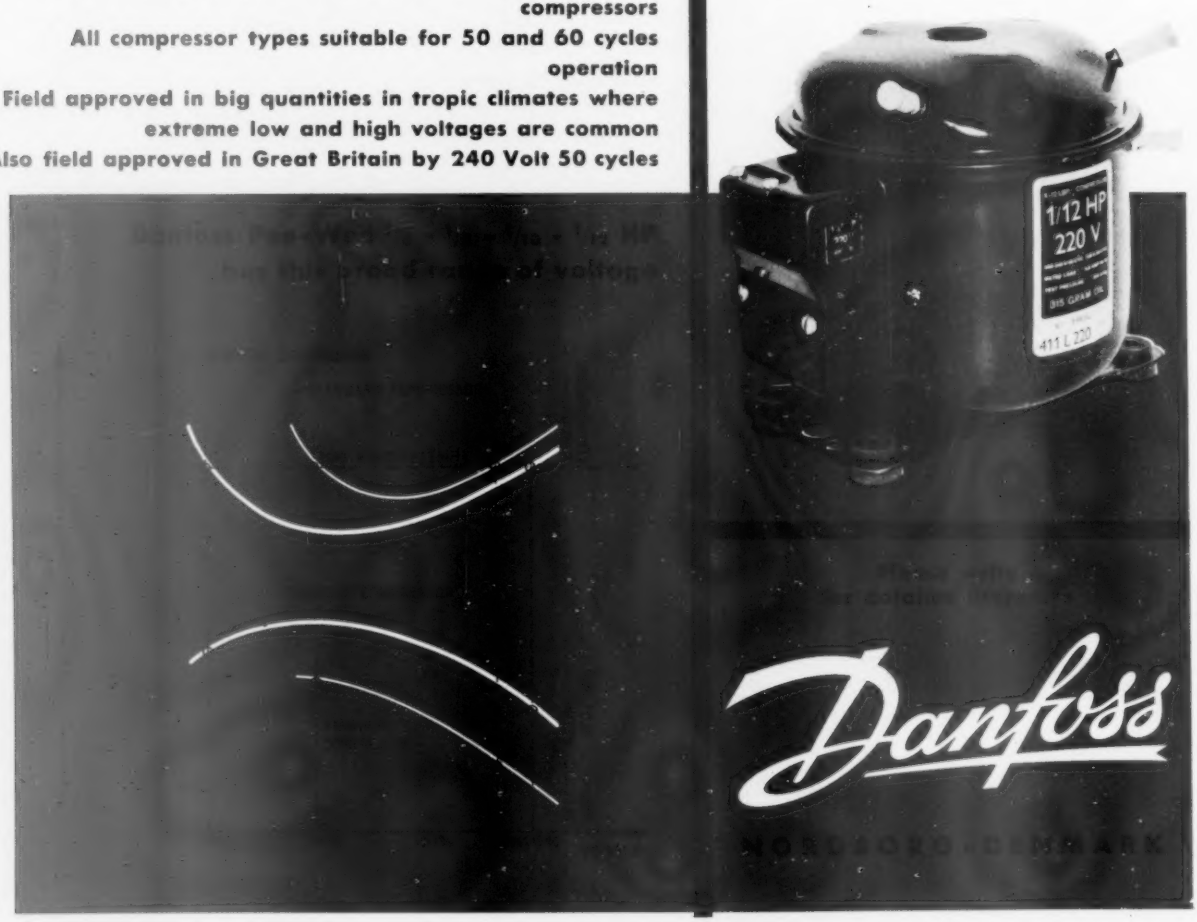

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